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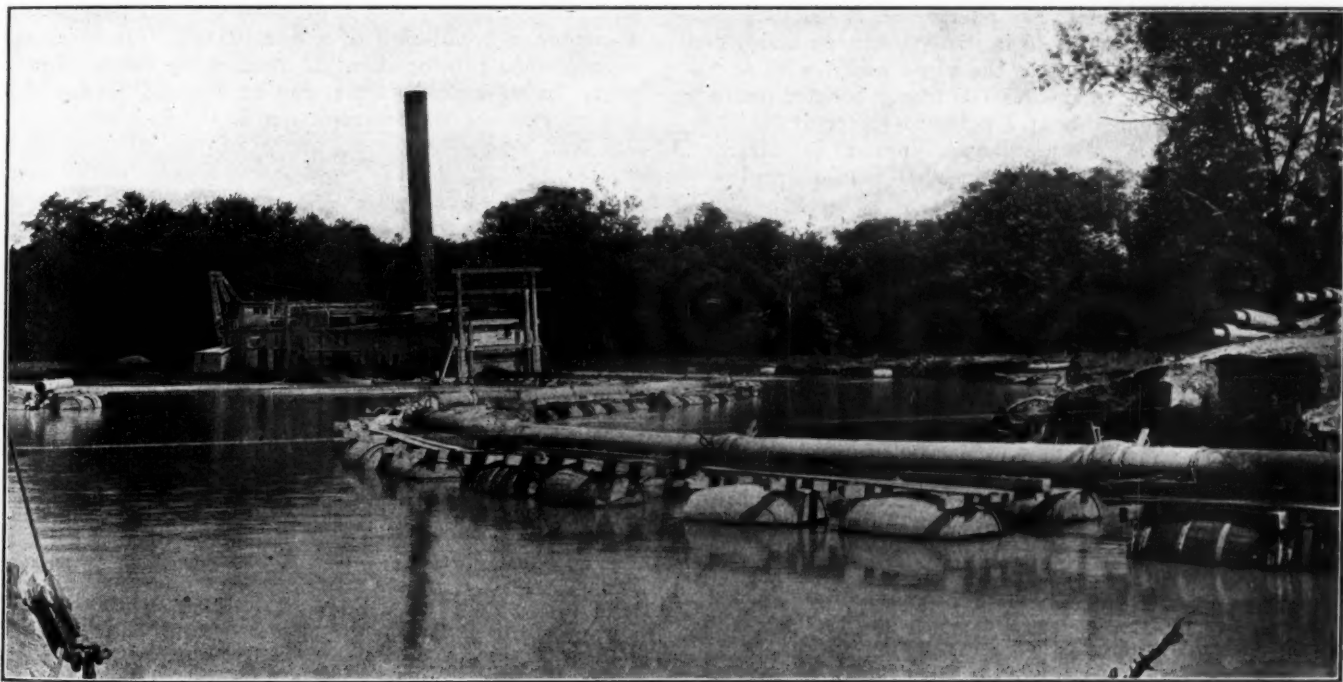
A FORTY-FIVE-CITY WATER SYSTEM.

One Company from One Plant Supplies Water to That Number of Communities—General Layout of Force Mains—Reservoirs—Main, High-Service and Booster Pumping Stations.

There are a number of private water companies in the county each of which operates several water systems; and there are several systems, both municipal and private, each serving several communities; but a company that, by single system, supplies water to forty-five communities or political units is certainly exceptional. Such is the Hackensack Water Company, which built its original works in 1883, and since that time has expanded over this wide area under the continuous supervision of D. W. French as superintendent. The fact that, since the original installation, the extensions into more and more communities have been in each case at their request and not on the initiative of the company certainly speaks well for the management.

comprises practically all of the State of New Jersey north of Jersey City to the New York state line and in the lower section between the Hudson and Passaic rivers.

The average daily consumption is 28,700,000 gallons, or about 96 gallons per capita. Most of this is supplied in two services, a high pressure and a low pressure, the former about 140 feet higher than the latter. About 20,000,000 gallons is used by the low service, nearly 8,000,000 of which is consumed by Hoboken; and about eight million by the Weehawken high service. In addition there is a small high service in Englewood supplied by a separate high service station that increases by about 100 pounds the pressure of about a million gallons a day; but in consequence of contemplated improvements in the



SUCTION DREDGE AT WORK ENLARGING ORADELL IMPOUNDING RESERVOIR.

The company now supplies eight boroughs, cities and towns in Hudson county and thirty-seven in Bergen county, New Jersey. These have a total population of 300,000 and include Hoboken, Weehawken, Hackensack, Ridgfield, Rutherford, etc. To supply these there are in use 520.4 miles of pipe, on which are 6,057 gate valves and 2,038 fire hydrants, 38,416 metered services and 1,600 unmetered. There are forty-six private fire services with 4, 6 and 8-inch connections, each provided with a Hersey "Detector" meter. There are, however, comparatively few factories supplied, the communities being largely residential suburbs of New York. The territory supplied

near future this station will be abandoned and the supply furnished by direct pumping to a reservoir from the main pumping station at New Milford.

The entire supply is drawn from the Hackensack river at New Milford, the area of the watershed above which point is about 115 square miles. The minimum stream flow is 12,000,000 gallons per day—less than half the average consumption at present. About five miles up stream, at Woodcliff Lake, was built a low earth dam with concrete core wall, impounding about 900,000,000 gallons. During the summers of 1910 and 1911 the storage here and in the distributing reservoirs was greatly re-

duced, and the company had to purchase water from Jersey City; but an impounding reservoir has been under construction since 1913 that will have a capacity of 2,000 million gallons. This full capacity will not be obtained for a year or two, but the method of construction (combined deepening and dyking by suction dredge) permits use of the successive capacities as they are created, the capacity at present being 1,400 million gallons. This reservoir is at Oradell, about $\frac{3}{4}$ -mile above the pumping station.

Water is taken from the river by an open concrete canal 250 feet long with a capacity of 50,000,000 gallons a day, which conveys it to a suction well under the pumping station. From this, two Allis-Chalmers centrifugal pumps, each driven by a Corliss tandem compound engine and with a rated capacity of 24,000,000 gallons a day, and a third of the same make and style of 35,000,000 gallons capacity, discharge the water through a 48-inch line 800 feet to a settling basin of 12,000,000 gallons capacity, earth embankment with masonry lining; from which a 54-inch line leads to a rapid filtration plant, consisting of 12 concrete filters, each with a capacity of 3,000,000 gallons in 24 hours, but planned for a 50-million gallon capacity. Beneath the filters is a clear water basin of 900,000 gallons capacity. From this a 54-inch line conducts the filtered water 250 ft. to the suction wells for the high-lift pumps.

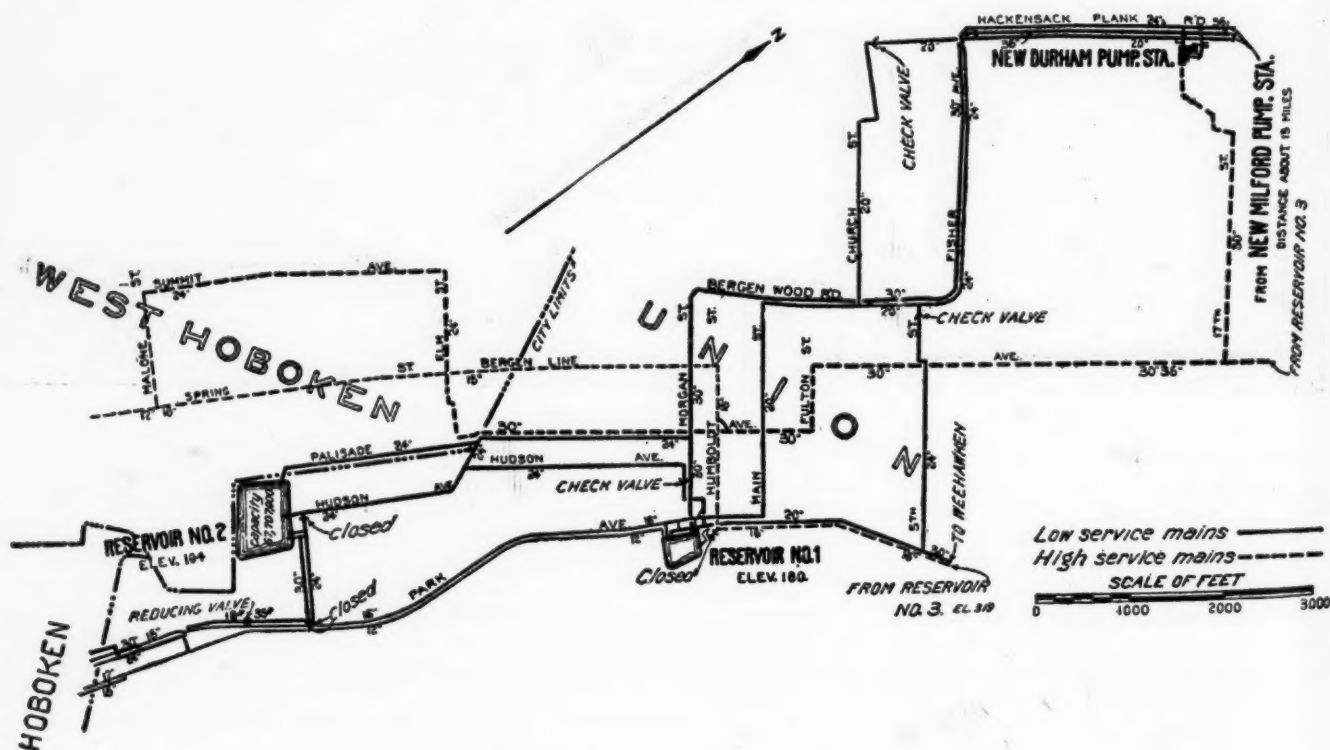
The water is then pumped by the high-lift pumps through three mains 20, 24 and 30 inches diameter respectively, following different routes for ten miles, when they are all cross-connected, the 20 in. and 30 in. having been cross-connected at two points in that distance. The 30 in. there increases to 36 in., and the three mains continue 3 miles further along the same route, with several cross-connections, to the New Durham booster pumping station; and thence about 2 miles to reservoir No. 1.

The elevation of the pump room floor at New Milford is 10 ft. above mean high tide. That of the overflow at reservoir No. 1 is 180 ft. About a mile south of this reservoir is reservoir No. 2 with elevation of 194, this being fed directly by the force mains, and also connected

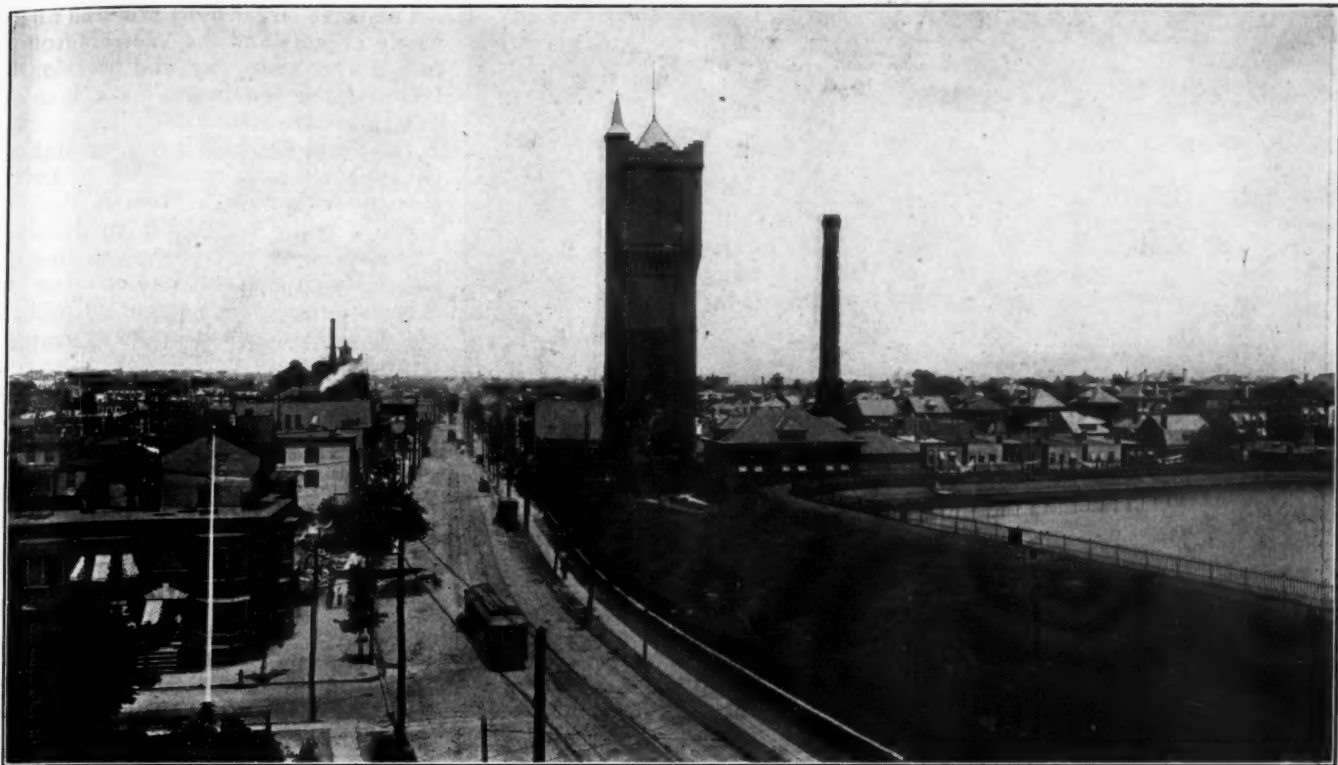
with reservoir No. 1 (see plan). Check valves, reducing valves, and gate valves closed except in emergencies, permit the regulation of pressures between these reservoirs and the several distribution systems. Reservoir No. 1, built in 1883 is of earth embankment with clay puddle bottom and brick-paved slopes; capacity 15,960,000 gallons. Reservoir No. 2 was built in 1896 and enlarged in 1901; the bottom is partly of concrete and partly clay puddle, in excavation and embankment, with stone-paved slopes; capacity 67,700,000 gallons.

At New Durham is a combined booster and high pressure pumping station, the elevation of the pump room floor being 27. At times of high consumption the flow to the furthest end of the system would require exerting more pressure at the New Milford station than is considered desirable, and the pressure in the low-service mains is increased here by two pumps. During the summer and winter months gates are closed in the three force mains opposite this station, and the booster pumps draw from above these gates under a head of about 55 pounds and discharge back into the same mains below the gates with about 25 lbs. increased pressure. Here also are two high-service pumps (replacing a high service station originally located at reservoir No. 1) that draw from the force mains and send a high-service supply by direct-indirect pumping to reservoir No. 3, located on the Palisades, at Fairview, and having an elevation of overflow of 318 and a capacity of 18,610,000 gallons. This reservoir is mainly in embankment with inside slopes paved with stone and the bottom of solid rock. This high-service supplies Union, West Hoboken, West New York, Guttenburg, part of Weehawken, and North Bergen, with a combined population of about 100,000. One high-service pump is run for about 12 hours daily throughout the year. In emergencies water can be drawn from the high-service reservoir to reservoir No. 1, 139 ft. lower.

The pumping station at New Milford maintains a nearly constant pressure of 125 pounds, and that at New Durham a minimum of 55 pounds. Owing to abundant storage in the distributing reservoirs, the maximum pumpage is little in excess of the average.



MAP OF PART OF FORCE MAIN SYSTEM.

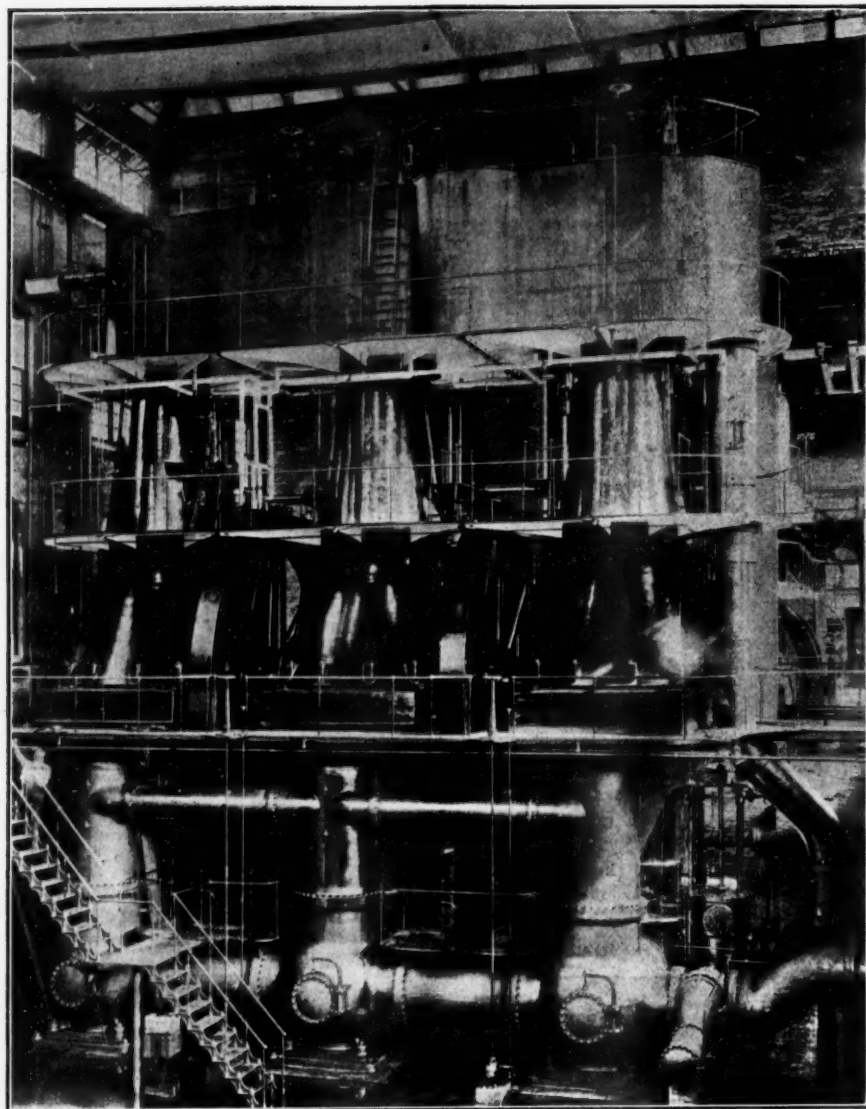


RESERVOIR NO. 1, WITH OLD HIGH-SERVICE ELEVATED TANK.

The country surrounding this reservoir was comparatively unpopulated when the reservoir was built. The high service was supplied by the high-service pumping plant and elevated tank (no longer in use since the pumping plant was built at New Durham and reservoir No. 3 put into service) seen in the background. This tower and tank enclosed in brick work is an illustration of an attempt to conceal the unsightliness of these by an enclosing masonry structure.



INTERIOR VIEW OF OPERATING GALLERY OF NEW MILFORD FILTRATION PLANT.



ONE OF THE PUMPING ENGINES AT NEW MILFORD.

PUMPING STATION.

The main pumping station at New Milford was built in 1883 and was enlarged in 1912. None of the original pumps are now in service, the oldest still in use being a Worthington horizontal tandem, compound condensing, duplex, double acting pump of 10,000,000 gallons capacity built in 1892, which is kept as a stand-by. There are three other high-lift pumps, two Allis-Chalmers and one E. P. Allis make, all vertical, triple expansion, condensing crank and fly-wheel, triplex single acting; the two first being of 12 and 18 million gallons respectively, and the Allis of 20 million. All use steam at 175 lbs. pressure. The three Allis-Chalmers low-lift pumps also use steam at 175 lbs. and make 120 revolutions per minute, two with a capacity of 24 and the other 35 million gallons. The low-lift pumps take suction from the raw water well and deliver water to the settling basin under slight head. The high-lift pumps have independent suctions from three connecting wells, two of which are under the station; and there is an emergency connection into the raw water well. There is practically no suction lift for any of the pumps.

The boiler plant here consists of four 250 horse-power boilers of Aultman & Taylor make, and two 500 horse-power of Sterling make, all horizontal water-tube type. Anthracite pea coal is used, delivered on a railway siding near the station. The plant is operated continuously in three shifts.

The three larger units are used alternately in pairs and the Worthington is turned over every day, and occasionally run for a few hours. The low-lift pumps are run alternately.

The New Durham pumping station contains a plant up-to-date in every particular. It contains four E. P. Allis vertical, triple expansion condensing, crank and fly-wheel, triplex, single-acting pumping engines; two of these being low-service boosters of 10 million and 20 million gallons capacity respectively, and two high-service pumps of 12 million and 14 million gallons capacity, all acting with 175 lbs. steam pressure. Steam is supplied by four Aultman & Taylor horizontal water-tube boilers, each rated at 500 horsepower, 5,200 sq. ft. heating surface and 88 sq. ft. grate surface. Anthracite and bituminous coal mixed is used, and is handled by a coal conveyer. A Greene fuel economizer and equipment for superheating steam form part of the plant. Coal is delivered on a railway siding near the station and about four months' supply is kept on hand in a coal house adjoining the boiler house. The operation of the plant is continuous in three shifts of not less than three men each.

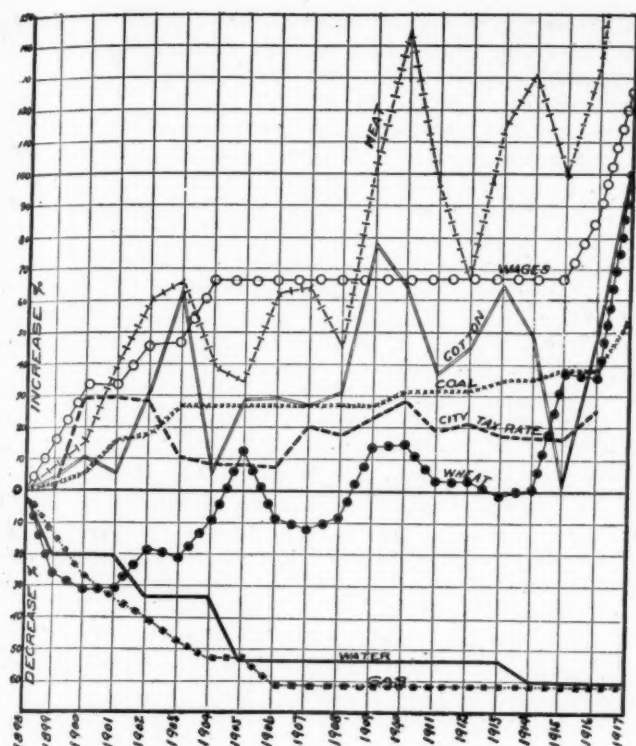
Plans and records of the company are quite complete and up-to-date. Complete records of the performance of each pumping station are kept, including pressure recording gauges. The main office of the company is in Weehawken; but local offices, store rooms and pipe storage yards are located at several points throughout the district, and automobile trucks and touring cars are used in the maintenance of the system, the various parts of which are connected through the public telephone system.

D. W. French is superintendent of the entire system; Earle Talbot is general assistant superintendent; E. E. Miller, assistant superintendent of power plants, and C. B. Parker, assistant superintendent of the pipe system.

METERAGE IN DULUTH.

The water and light department of Duluth has been installing meters steadily during the past twenty years. In 1898 the percentage of services metered was 44.5; in 1916 it was 90.2, the meters totaling 10,781. Figures prepared by D. A. Reed, manager of the department, show that it costs much more to supply unmetered services than it does to supply those consumers who are metered. Last year, though the flat rate unmetered consumers numbered less than 10 per cent of the total, the water used by them plus leakage was 45¼ per cent of the total. Allowing 20 per cent for leakage, about 10 per cent of the consumers use approximately 25 per cent of the water, or several times the average used by all customers. Considering the fact that all large consumers are metered and that only the very small consumers are on a flat rate, the ratio of average consumption between metered and unmetered consumers is even greater than it appears.

Since 1908 the number of unmetered services has de-



COMPARISON OF COST OF WATER AND GAS IN DULUTH, MINN., SINCE 1898, WITH COST OF OTHER ITEMS OF LIVING.

creased steadily. It has been the policy of the department to install meters on all new services and to meter old services as rapidly as possible. Certain classes of consumers have been exempt from this rule, such as those having no connection with the sewer or drain and where the premises are such as to make it difficult to protect the meters from freezing. The department believes, however, that this latter class of users should be subjected to restrictions of a meter service more completely than the average consumer, as on account of the exposed condition of the premises much water is liable to be wasted by allowing the water to run to prevent the pipes from freezing.

Mr. Reed further estimates that if those consumers now on a flat rate were metered and their consumption reduced to the general average of other consumers now on a meter rate the saving would approximate 19 per cent of all the water used and the reduction in power cost for pumping alone would be about \$3,500 per year. This amount would purchase and set 400 meters and would in three years be sufficient to complete the metering of the entire system.

Manager Reed is now advocating that the city lay the services from the main into the meter, instead of stopping at the curb as at present; the object being to insure that the service pipes are laid satisfactorily to the department. Last winter nearly 600 services were frozen because laid at insufficient depth. In the climate of Duluth it is considered that services should be 7 ft. deep, and this would be secured if the department laid them. The owner would be charged for the service, but thereafter the department would maintain it.

DEVELOPMENT OF A WATER SYSTEM

History of That of New Bedford, Mass.—Population Doubled in Fifteen Years—Meters Increased

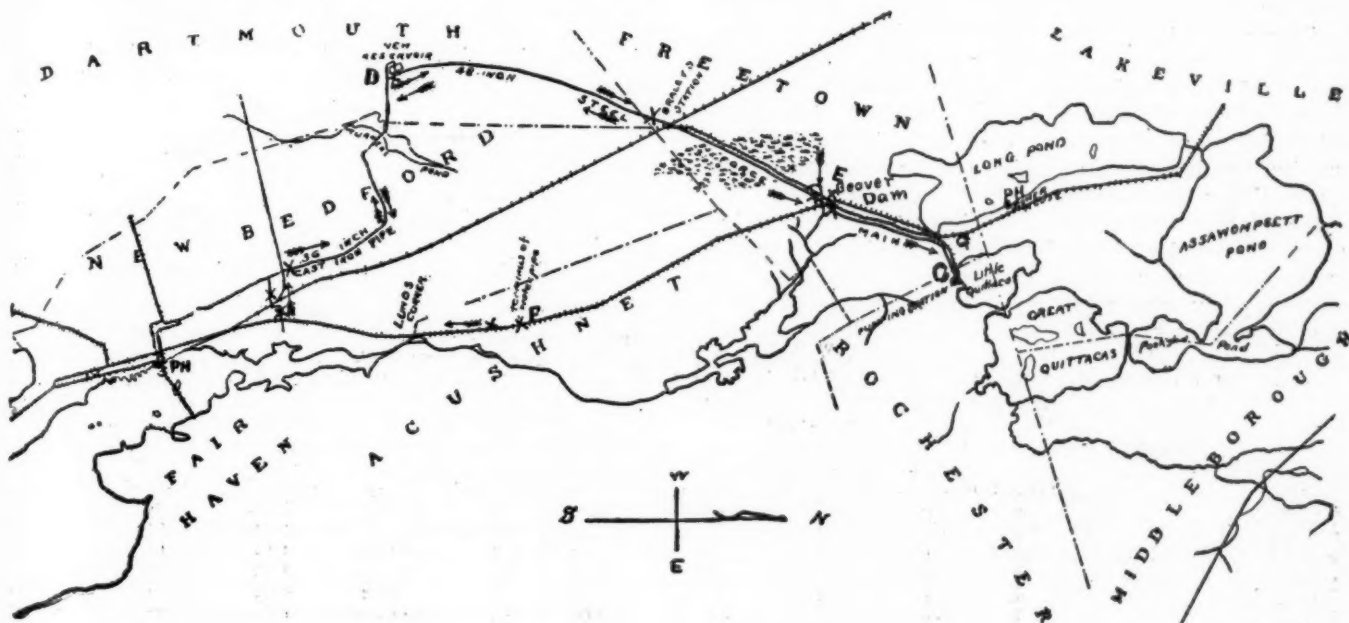
Ten Fold—Developing the Supply

By ROBERT C. P. COGGESHALL*

The history of the development of the waterworks supply system of New Bedford, Mass., is one of interest to any city that has grown as rapidly as this one has, it having practically doubled its population in the past fifteen years. Moreover the recent construction of many factories within its limits has greatly increased water consumption. In the fifteen years in which the consumers have doubled in number, the average daily consumption has increased 35 per cent, while the consumption per consumer has decreased 33 per cent. Meters have increased from 1,429 to 14,481; taps from 9,280 to 15,350 and per cent of taps metered from 15.4 to 95.7.

The matter of a water supply for New Bedford was first taken up in 1860, but the first water was not intro-

*Superintendent of Waterworks, New Bedford, Mass., for the past 34 years.



MAP SHOWING STEEL FORCE MAIN FROM PUMPING STATION TO NEW BEDFORD. Arrows show direction of flow in main of current from electric railway.

duced into the city till 1869. The population at that time was 22,000 and plans provided for an adequate supply for 50,000. The plan included the construction of a dam across the Acushnet river seven miles from the city. From the reservoir formed by this dam, water was carried through a brick conduit to a pumping station on the outskirts of the city, whence it was pumped to a distributing reservoir on one of the hills in the city. This supply was sufficient till 1885, when extensive additions became necessary. The supply was augmented by water from Little Quittacas Pond, five miles away, and additions were made to the pumping equipment and to the distribution system.

With 58,000 population in 1899, it became necessary to make more improvements. The source of supply was



LITTLE QUITTACAS PUMPING STATION.

inadequate and it was necessary either to spend a large amount of money on the intensive development of the old system, or to build new works, incorporating into them as much as possible of the old system. Reports by engineers made in 1895, when it became evident that an increase in the supply was imperative, recommended the use of a further supply from Little Quittacas Pond. This plan was adopted and the works were completed late in 1899.

These consisted of a 48-inch steel force main and a pumping plant with a capacity of about 15 million gallons per 24 hours. This is located on the shore of Little Quittacas Pond, 12 miles from the city and at elevation 62. From here the water is pumped through a 48-inch steel force main $8\frac{1}{4}$ miles to High Hill reservoir, Dartmouth. This reservoir, with a capacity of 67,000,000 gallons, is at an elevation of 216, and distribution is by gravity through the city, which is only a few feet above sea level, for the most part.

During the construction of this system the Acushnet plant was used and at times, was taxed to its utmost capacity. The old plant is now held in reserve, since the new plant with a capacity of 12 million to 15 million

gallons is adequate for present needs. The pumping plant at Little Quittacas comprises two Leavitt vertical, compound, condensing, beam and fly-wheel, duplex, double acting, differential plunger pumps, rated at ten million gallons per day. This year, a 5-million gallon electric driven, centrifugal booster pump will be added to the pumping equipment at this station.

The growth of the city has been phenomenal, and mills, all large water users, are springing up in large numbers—four are now in various stages of completion. As a consequence of this growth of the city, the needs for better distribution have been almost as pressing as was once the need of a new supply. To meet these needs, there has been a tremendous enlargement and improvement of the distribution system. A great deal of the 4-inch pipe has been replaced with 8-inch, so that most of the minor distributors now are either 6-inch or 8-inch, while 54 per cent. of the total amount of pipe in the system is over 6-inches in diameter. Especial attention has been paid to gridironing, and dead ends are restricted to outlying districts; less than 7 per cent. of the total mileage is in 4 or 6-inch dead ends. Most noteworthy of all has been the construction—begun in 1909—of a 30-inch main outlining the city. A short section of this remains to be completed and will probably be laid during the coming season.

The consumption for the past year showed a daily average of 8,500,000, but there are times, especially on Monday morning, when the peak is at the rate of 18,000,000 to 20,000,000 gallons, and when the new mills are added there will be a considerable additional increase. During the past few years supplies have been furnished to two sections or towns in Dartmouth and one near New Bedford. In such cases, the city installs a meter at the town line and charges for the water at current rates, the towns being treated as large consumers only. The water is retailed by them in whatever manner they desire.

In 1909, it was decided to meter everything, including the public supplies, and this policy has resulted in reducing the per capita consumption from 107 in 1900, when 15.4 per cent. were metered, to 75 in 1916 with about 95 per cent. metered.

The energies of the city have also been turned to forestry development work on the watershed. It owns 18,000 acres—all the land around and all the islands in the lakes supplying water to the city—and is planting this area with pine trees. A nursery is maintained at the pumping plant at Little Quittacas Pond and from this are supplied for planting the meadow and scrub areas from 30,000 to 50,000 young trees yearly. At the same time selective timbering and cutting has been carried on in the wooded areas, where preference is given to cutting oaks on account of the prevalence of the gipsy moth.

The following are consumption and meterage records for the past 34 years:

Maintenance of Meters in New Bedford During the Year 1916.

Size.				Cost.	Cleaned and Tested Only			Total number repaired, cleaned, and tested.	Total Cost.
	Frozen	Other Repairs.	Repaired. Total Number Repaired		Average cost per meter. cleaned and tested.	Total number cleaned and tested.	Average cost per meter.		
6 inch.....	0	5	5	\$25.66	\$5.13	4	\$22.04	9	\$47.70
4 inch.....	0	17	17	176.54	10.38	19	87.83	36	264.37
3 inch.....	0	5	5	67.73	13.54	6	24.78	11	92.51
2 inch.....	0	9	9	36.04	4.00	25	88.99	34	125.03
1½ inch.....	0	0	0	0.00	0.00	3	8.85	3	8.85
1 inch.....	3	24	27	115.59	4.28	10	10.60	37	126.19
¾ inch.....	17	83	100	251.40	2.51	76	80.80	176	332.20
½ inch.....	210	747	957	2,304.95	2.41	630	659.40	1,587	2,964.35
Totals	230	890	1,120	\$2,977.91	....	773	\$983.29	1,893	\$3,961.20

Consumption and Meterage in New Bedford for 34 Years.

Year.	Estimated pop- ulation.	Estimated No. of consumers.	No. of taps.	Gals. per day to each inhabitant.	Gals. per day to each cons'm'r.	Gals. per day to each tap.	No. of meters.
1882.....	28,500	20,424	4,203	82	114	553	41
1883.....	30,000	22,249	4,465	78	105	521	49
1884.....	33,000	23,749	4,691	72	100	506	60
1885.....	33,700	25,375	4,965	85	113	579	67
1886.....	34,500	28,480	5,225	86	104	569	83
1887.....	36,000	30,080	5,495	85	101	555	102
1888.....	37,500	31,826	5,785	89	109	581	108
1889.....	40,000	34,000	6,104	90	106	588	120
1890.....	41,500	35,740	6,394	98	114	636	123
1891.....	45,000	38,500	6,742	92	108	615	135
1892.....	50,000	41,776	7,134	88	105	616	144
1893.....	55,000	44,158	7,531	99	113	664	172
1894.....	56,000	44,661	7,767	85	107	616	221
1895.....	56,300	45,154	8,027	84	102	587	254
1896.....	59,000	48,570	8,447	89	108	623	366
1897.....	60,000	50,000	8,860	95	113	641	621
1898.....	58,000	50,000	9,014	102	118	655	734
1899.....	58,000	50,000	9,151	107	124	677	1,098
1900.....	62,500	55,000	9,280	101	115	681	1,429
1901.....	65,000	57,000	9,447	91	103	624	1,566
1902.....	70,000	61,000	9,612	91	104	663	1,771
1903.....	72,000	62,000	9,927	96	112	700	1,954
1904.....	73,000	63,000	10,166	96	111	689	2,145
1905.....	75,000	66,000	10,477	95	107	677	2,434
1906.....	83,000	76,000	10,764	83	91	643	2,803
1907.....	88,000	81,000	11,107	84	91	670	3,196
1908.....	89,000	82,000	11,516	84	91	653	3,628
1909.....	95,000	88,000	12,043	79	85	621	4,572
1910.....	99,000	92,000	12,769	79	85	616	6,106
1911.....	102,700	96,000	13,311	78	83	599	8,206
1912.....	103,000	97,000	13,643	80	85	607	9,998
1913.....	104,000	99,000	14,055	75	78	552	12,340
1914.....	108,000	103,000	14,407	69	72	516	13,788
1915.....	110,000	107,000	14,770	70	71	518	14,140
1916.....	113,000	*111,120	*15,350	75	77	*556	14,481

*Includes population supplied in towns of Dartmouth and Acushnet: 224 taps, 1,120 consumers.

SPRINGFIELD WATER WORKS NOTES

Department Manufactures Sulphate of Alumina—Elevator Motors—Public Use of Water—Scarcity of Labor Limits Pipe Laying

The annual report for 1915 of the Board of Water Commissioners of Springfield, Mass., contains a number of interesting items, one of these being that a plant has been installed at the West Parish filters for manufacturing the sulphate of alumina that is used there as a coagulant, because of the difficulty experienced in obtaining a supply of this material and the increased cost of it. This sulphate of alumina plant has been in operation since July, 1916, with satisfactory results and a substantial saving in cost of coagulant over the prevailing market price.

Concerning this, Elbert E. Lochridge, chief engineer, reports: "The shortage and high price of sulphate of alumina used at the filtration plant for color reduction and purification of the water made necessary the construction of the necessary equipment by which this material could be manufactured in our own buildings. Other cities have found this same trouble, and I am informed that at the close of this year Springfield is one of four American cities to have taken this step."

There are still some hydraulic elevators operating by direct pressure from the city mains, but the board is endeavoring to reduce this service as much as possible. No new connections for this purpose are allowed, but the board permits those now in use to remain until, in its judgment, the discontinuance of such elevators "may be deemed to be warranted by reason of the owners' changes, alterations, or replacements of said elevators, or of the property where same are located, or when any other power may be deemed to be economically available: such elevators, meanwhile, to be subject to any regulations of the board." The board, however, aims to elim-

inate all connections of elevators to the city mains as rapidly as it can do so without injustice or undue hardship to owners who have already installed them in good faith and in the absence of any instructions to the contrary.

Concerning the public use of water, the board states that it believes that, without exception, all the citizens who have in the past served as members of the water board have arrived at the same conclusion, "that this municipally owned and operated water works is a public utility in the same sense as one privately owned and operated, and should be managed exclusively as such and along similar business-lines, and as a public service enterprise or investment of the people who comprise the municipality. It has always been the firm opinion of the water commissioners, past and present, that if the municipal public utility is to be rightfully conducted it is entitled to all its just earnings, for supply furnished and services rendered both to the individual consumers and to the municipality as well, to the end that it may properly assume and pay all its liabilities, furnish absolutely first-class protection and service to the people, and, lastly and most particularly, that it may use its actual surplus earnings in the reduction of rates to consumers."

During the year 1916 the municipality used water which, on the basis of 5c per hundred cubic feet and \$25 per fire hydrant per year, was worth \$68,824; of which about 65 per cent was for fire hydrants, 19 per cent was for schools, over 8 per cent for flushing sewers, about 3 per cent for public buildings other than schools, and the remainder for public parks, playgrounds, street and engineering department, street sprinkling and washing, water tanks and draining fountains, while about \$1,070 worth was used by the Merz garbage reduction plant without cost. Meters have been placed on such municipal services as the funds of the water works have allowed, and this has resulted in more careful oversight and control of such use by the city officials in charge of the same, in some cases reducing the quantity of water used or wasted by more than 50 per cent. Of the amounts of public uses just referred to 91 per cent of the water used by schools was metered, 56 per cent of that used by public buildings other than schools, and 13 per cent of that used by public parks. The board believes that if meters were installed on other municipal services, such as park fountains, fire stations, etc., similar reductions would follow in these cases also. Should the city pay the department for this municipal use of water, it could materially reduce the water rates to private consumers.

Superintendent Martin reports that during the year there was quite an epidemic of the breaking of hydrants by automobiles, 16 having been broken in this way. When the automobile was insured there were usually no difficulty in collecting the cost of repairing the hydrant. Eight bills for breaking hydrants were collected during the year, aggregating \$124.13.

The superintendent reported that, although the pay of all laborers in the department had been raised an average of 62/3 per cent, it had been impossible to keep men on the pipe-laying gang, as every man who was not getting at least \$2.75 deserted for higher wages with contractors, so that the regular pipe-laying gang, which usually carries from 30 to 50 men, was reduced to 10, all of whom were old standbys, who had been with the city for more than 10 or 15 years. Because of this handicap, the department was unable to keep up with the extension work, and Superintendent Martin expressed the belief that if the shortage of men continued this sea-

son a trenching machine would become necessary as a part of the equipment for this year.

About five miles of pipe was laid last year, but double this amount will probably be called for in 1917. Owing to the inability to lay as much pipe as was anticipated, the pipe yard is well stocked for this season with pipe purchased for last year's work. As the value of this pipe has increased nearly 100 per cent since it was purchased, Mr. Martin is congratulating himself upon the investment the city has made.

OAK PARK'S WATER WORKS REPORT

**Records Unusually Complete and Well Classified—
Booster Pumping Plant for Increasing Pressure
—Meters and Consumption—Maintaining
Appurtenances**

Oak Park, Ill., is a suburb of Chicago, having a population of about 32,000. In 1885 it began obtaining water from a private company, but in 1912 this original plant became merged with a municipal plant which had been built in 1909. Since the combination, all the water has been purchased from Chicago; but the pressure was very low, and since 1912 a booster pumping plant has been in operation raising the pressure in Oak Park.

From the report for the year 1916, of W. F. Sargent, superintendent of the plant, it is apparent that the records and accounts of the Oak Park system are kept in an unusually thorough and business-like manner, unit and service costs and other details being kept for all the various operations of the department. This information is given in a series of well arranged tables. The first of these gives, for the past eight years, the population supplied; number of meters; miles of mains; consumption—total annual, average per day, average per day per capita, average per day per meter, minimum night rate per day and per capita and per meter, and per mile of mains; total revenue; total maintenance cost; cost of meter operation and maintenance; cost of operation and maintenance per thousand gallons; amount paid Chicago for water; receipts from sale of water; and the last two reduced to amount per gallon.

The number of meters in 1909 was 206, which has increased to 7,478 in 1916. In the meantime the miles of mains have increased from 24 to 80.67, and the average consumption per day has increased from 200,000 gallons to 2,260,000. The per capita figures are not given for all the items prior to 1913, but during the last four years the per capita consumption has varied from a minimum of 65.6 to a maximum of 71.0, that for 1916 being 70.6. During the same period of time the minimum night rate has varied from 12.5 in 1916 to 28.5 in 1914; and the minimum night rate per mile of mains has varied between 6,198 and 10,055. During these four years the average revenue per meter (exclusive of hydrant rental) has varied from \$15.64 to \$16.66, while the total operation and maintenance cost (exclusive of plant interest and depreciation) has varied from \$11.83 to \$13.66. The figures show a revenue per thousand gallons varying from 13.9c. to 14.7c. and a total operation and maintenance cost varying from 10.7 to 11.9. The amount paid the city of Chicago per thousand gallons were 6¼c in 1916, the maximum rate paid during the 8 years having been 7.3c. The revenue from sale of water only was 13.7c in 1916, having been gradually increasing from 11.6c in 1912.

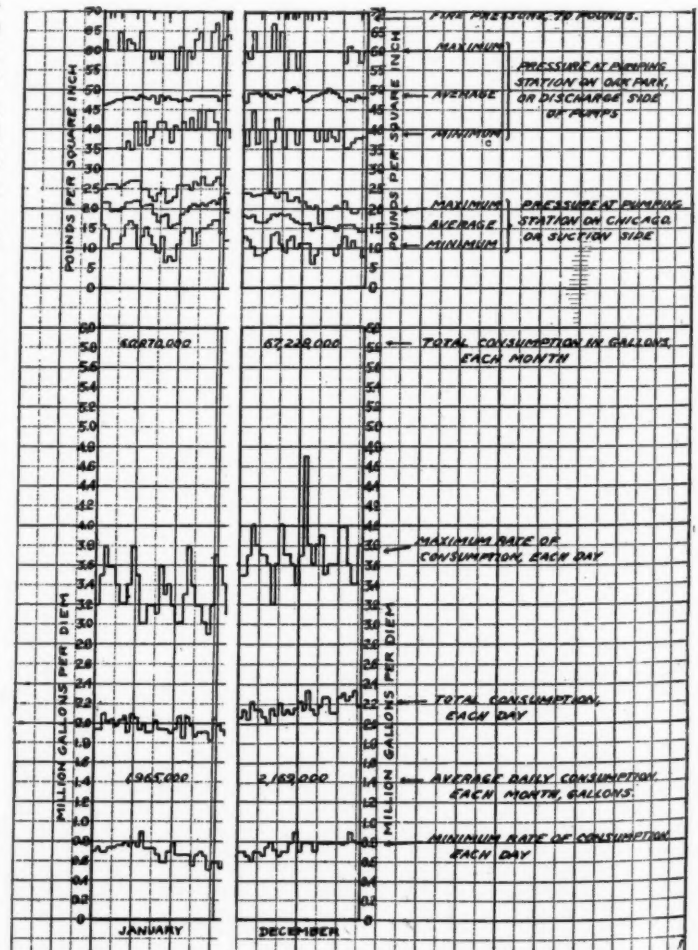
An illustration of the detail in which the accounts are kept is offered by the record of maintenance of fire hydrants. Two kinds of hydrants are in use, one the Eddy and the other the Mathews, and the records are

given for each make of hydrant separately. In 1916 there were 1,009 hydrants of both kinds. Of these, 813 were oiled and caps greased at a total cost for labor of \$158.97 and for material of 75c. 18 had drains repaired to prevent leakage and freezing, at a total cost of \$61.03 for labor and \$4.22 for material. 9 hydrants were damaged by frost or vehicles and repaired at a total cost of \$81.74 for labor and \$137.24 for material. The stuffing boxes of 132 were packed to prevent leakage, at a cost of \$64.96 for labor and \$7.75 for material. Leaks were repaired in 35 fire hydrants at a cost of \$112.18 for labor and \$53.34 for material. The total cost of maintaining the 1,009 hydrants for the year was \$684.42.

In similar detail are given the costs of maintaining mains, valves, valve boxes, meter boxes, and other appurtenances. A separate item was the cost of maintaining street excavations, caused by settlement of the ground, this having been \$41.74 for labor in putting in condition eight settlements of this kind.

Another table gives a detailed statement of inspections and troubles calling for special attention of the department, such as services shut off and turned on, investigation for leaks on account of high bills, tests of meters, general complaints, repairing meter dials, etc.

Another table gives in detail the number of meters which were taken to the shop for repairs, giving the name and size of each meter and the reason for repairing it. The causes were divided into the two general classes of not registering, and other causes. Under the head of not registering, 184 meters were damaged by heat and 85 were damaged by cold; 122 had disks



RECORDS OF OAK PARK WATER DEPARTMENT.
The original sheet showed continuous records for the entire year.

broken by foreign matters or water hammer and 92 disks stopped by obstacles, but not broken; 20 had chambers sprung by foreign particles; 39 had miscellaneous damage to gears, pawls, etc. Among the causes other than non-registering were; meters removed and replaced by others, tested at request of consumers, and meters purchased from the private company in 1912 and not previously tested. As stated previously, the total number of meters in service at the end of the year was 7,478, and the total number in the shop was 1,482, but 790 of these were removed for testing only, and 150 in order to be replaced by others. Repairing of meters for the year cost a total of \$344.65.

Pumping station figures show that the water as received from Chicago varied in pressure from 10 pounds to 5 pounds on the suction side of the pumps, while the pressure on the discharge side of the pumps varied from 25 to 67. The average pressures on the suction and discharge ends, respectively, were 16.9 and 47.9.

The per capita consumption varied from a minimum of 60.4 in February to a maximum of 92.8 in August; the average for the year was 70.6.

The average total daily consumption for the year was 2,260,000 gallons per day, while the maximum consumption for one day was 3,600,000 on July 29th and the minimum was 1,812,000 on April 9th.

The largest item of receipts was \$73,399 on meter rate bills, and the next largest was \$10,000 for hydrant rental, \$3,650 additional having been received for fees for permits, tapping service cocks, shut-offs, etc.

With the report were given copies of records in the

form of charts from the Venturi meter and recording pressure gauges at the pumping station, showing the pressure on the suction and discharge sides of the pumps and the daily consumption, with separate curves showing the maximum and minimum for each day.

COST OF LAYING WATER PIPE IN FALL RIVER.

During 1915, the Fall River, Mass., water department laid 7,466 feet of cast iron pipe, all 6 and 8-inch, at a total cost of \$11,447.56. The itemized costs for the work are as follows:

Cost per Foot (In Cents).											
Distance, Feet.	Percentage of Rock.	Size of Pipe.	Pipes and Specials.	Hydrants, Gates and Boxes.	Cartage.	Labor and Cartage.	Material for Joints.	Sharpening Tools.	Incidentals.	Cost per Foot.	Total Cost.
80	.. 8	.541265	1.2746	.06	.02	.024	1.9186	\$153.49
88	.. 6	.4152	.5966	.0668	.426	.0597024	1.6215	133.89
495	.. 6	.485	.106	.0126	.4691	.0667	.0103	.024	1.1611	574.74	
254	21 8	.5528	.3092	.0197	.8543	.0633	.0225	.0738	1.8759	476.48	
423	42 8	.557	.186	.019	.7986	.068	.0283	.09	1.7279	730.90	
595	.. 8	.5582	.3573	.0437	.7422	.0635	.018	.024	1.7635	1,049.28	
353	.. 8	.5340	.1444	.0437	.5609	.0533	.012	.024	1.3286	469.00	
422	.. 8	.5453	.1244	.0089	.4670	.0762	.0111	.04	1.264	533.41	
377	.. 8	.528	.2999	.023	.6164	.0533	.0154	.025	1.538	579.83	
625	.. 8	.587	.2512	.0109	.6122	.0664	.0139	.024	1.5547	971.69	
313	.. 8	.5973	.2542	.0324	.5835	.0805	.0209	.02	1.5564	487.15	
305	.. 8	.55	.32	.1265	1.0746	.06	.025	.04	2.0446	631.23	
232	.. 8	.50	.11	.1265	.7446	.06	.02	.03	1.4646	339.79	
40	.. 8	3.044	.1965	.1437	2.0883	.3267	.0182	.039	7.4812	299.25	
13	.. 8	.4992	..	..	.5608	.1238	.0082	.024	1.2157	15.80
544	.. 8	.603	.183	.052	.5889	.0691	.0182	.024	1.5862	808.49	
286	25 8	.55	.10	.1265	1.2747	.06	.0202	.03	2.0849	596.28	
533	.. 8	.5376	.0956	.0437	.4455	.0536	.0182	.024	1.1745	626.01	
596	.. 8	.5231	.1661	.0437	.4914	.0534	.0182	.024	1.2762	760.62	
13	.. 8	.4992	..	.0437	.4455	.1678	.0082	.024	1.1447	14.88	
350	.. 6	.4039	.1166	.0236	.6148	.0759	.0155	.05	1.2767	446.85	
13	.. 6	.3448	..	..	.5608	.0928	.0192	.024	1.0416	13.54
510	.. 8	.5465	.2050	.005	.5838	.0662	.0156	.024	1.4411	734.96	

WATERWORKS STATISTICS OF AMERICAN CITIES

Superintendents of More Than Eight Hundred Municipal and Private Plants Have Sent Information to Municipal Journal During the Past Fortnight Concerning Sources of Supply, Distribution Systems and Appurtenances, Pumping Plants, Purification Plants, Services, Meters and Other Details.

The tables in this issue, our annual water works statistical number, contain data from more than eight hundred cities, towns and other municipal units—fully 50 per cent more than have ever been represented before in Municipal Journal or in any other tabulation of water works statistics. They are presented in three tables, the first giving the population, number of consumers, daily consumption, percentage of services metered, source of supply, head pumped against, and whether lifted to reservoir or to standpipe or simply against a pressure head, the kind of pumping plants used and the kind of treatment of water, if any. In Table No. 2 is given a description of the distribution system—the length of each size of main and the material composing it; while in Table No. 3 are recorded the numbers of fire hydrants, gate valves, service connection, meters, motors and elevators connected, private fire connections and the kinds of meters used on the last.

The figures for population, number served with water, and average consumption are probably more or less estimates in most cases, as is the case with all collections of figures under these heads. In some cases the amount was measured as total pumpage; in others, where all services are metered, it may have been the sum of all the meter readings. Similarly, the percentage metered was in some cases the percentage of services metered, although the question asked was the total consumption metered; but in other cases the percentage of total amount pumped that passed through the meters was apparently given.

In stating whether the water is pumped to standpipe or reservoir, the word "tank" is used for brevity to indicate an elevated tank and tower; and where the word "direct"

is used it implies direct pumping without the use of either standpipe or reservoir.

In the description of pumping machinery, many of the replies were indefinite, while still more were so full that it was impracticable to give them all in the table, especially where there were three or four different kinds in the same station. We expect to give this information more at length later. The information as to kind of power used is especially interesting as showing the considerable number of plants using electric motors for pumping, some operating centrifugal and others power pumps.

Under the head of "Purification Process," "rapid filters" and "slow filters" of course refer to sand filters in each case. "Coagulation," "lime," "alum" are recorded as reported, probably implying filtering or sedimentation in most cases.

In Table No. 2 the lengths of pipe are given in either feet or miles. As no city reported more than 100 miles of any size or less than 100 feet, there can be no question as to which is intended in each case. The abbreviations used refer to cast iron (c. i.), wrought iron (w. i.), steel (st. or stl.), wood (wd.), concrete (con.), kalamine (kal.).

In Table No. 3 it will be noticed that in a few cities more meters are reported than service connections. These figures are as reported, and may be explained by the use of several meters in connection with one service connection in some cases, as of apartment houses; or by the fact that the number of meters given includes those held in reserve in the storehouse. In a few cases consumption is reported as all metered, and yet more services than meters; the explanation being that services are included that are "dead," connect to houses temporarily unoccupied, etc. The sizes of taps given are in inches in each case, as are also the sizes of "conduit to city."

TABLE NO. 1—GENERAL.

City	Population	No. supplied with water	Average consumption	Per cent metered	Source of Supply	Per Cent of Total Supply Pumped	Head	Pumped to	Kind of Power Used	Kind of Pump	Purification Process
Alabama:											
Anniston	21,000	9,000	2,087,000	70	Springs	All	333 ft.	Reservoir	Elec. & steam	Hor. Centr.	None
Gadsden	15,000	1,200	600,000	100	River	All	138 ft.	Reservoir	Steam	Reciprocating	Sand filters
Jacksonville	3,000	1,200	70,000	1 1/2	Spring	None	180 ft.	.....	.....	Air lift	None
Marion	2,500	52,000	150,000	75	Deep wells	All	70 lbs.	Reservoir	Steam	Horizontal	Hypochlorite
Mobile	65,000	52,000	7,917,000	50	Creeks	.....	140 ft.	Standpipe	Steam piston	Horizontal	None
Selma	18,000	4,000	1,200,000	95	Wells	All	85 lbs.	Standpipe	Electricity	2-stage Centr.	Chlorine gas
Talladega	7,000	4,000	700,000	.....	Spring & wells	All	.....	.....	.....	.....	.....
Arkansas:											
Troy	7,128	4,000	250,000	83	Wells	All	330 ft.	Standpipe	Electric	Centrifugal	None
Tuskegee	2,500	900	100,000	90	Springs	All	95 lbs.	Standpipe	Steam	Centrifugal	None
Union Springs	4,200	.....	200,000	50	Well	All	150 ft.	Tower	Steam	Air lift	None
California:											
Hot Springs	15,000	.....	1,800,000	100	Impounding reservoir	100	245 ft.	Reservoir	Electric, steam reserve	Elec. ctr. and steam recip.	Rapid sand
Mena	3,530	1,000	.....	..	Wells	All	.....	Standpipe	Gasoline	.....	None
Pine Bluff	20,000	20,000	843,000	100	Gravity and well	33	200 ft.	Reservoir	Steam	Duplex	None
Glendale	8,600	8,500	927,000	100	Purchased Wells	None	130 ft.	Elevated steel tank	Electric	Centrifugal	None
Grass Valley	8,000	7,000	750,000	None	.....	.....	.....	Reservoir	Electric	Centrifugal	None
Lodi	3,500	3,465	.....	1	Creek and wells	60% in summer	110 ft.	.....	Electric	Centrifugal	None
Monrovia	5,500	5,500	.....	100	Wells	All	103 ft.	.....	Steam	Hor. direct	None
Oxnard	4,000	4,000	800,000	100	Wells	All	150 ft.	Concrete tank	Electric and steam	Deep well centr., single and comp.	Chlorine
Pacific Grove	10,000	10,000	1,000,000	100	River	All	.....	.....	.....	.....	None
Palo Alto	5,565	5,540	525,000	100	Wells	All	.....	.....	.....	.....	None
Colorado:											
Pomona	12,000	10,000	.....	60 to 65	Gravity and wells	25 for 5 months	.....	Reservoir	Electric	Centr. com-pound	None
Riverside	18,000	18,000	4,870,543	.....	Wells	Part	90 ft.	Reservoir	Electric	Centr., deep well, triplex turbine.	None
San Diego	92,000	92,000	8,000,000	100	Impounding reservoir	17a	180 lbs.	Reservoir	Electric	4-stage centr. air-lift	Chlorine, rapid filter
Santa Cruz	12,000	10,000	1,500,000	65	Impounding reservoir	None	.....	.....	.....	.....	.....
Santa Rosa	11,000	2,423	725,000	80	Wells	All	60 lbs.	Reservoir	Electric	Centr. and air lift	None
Sierra Madre	1,700	1,700	33,700	100	Tunnel, wells, stream	10-75	130-300 ft.	.....	.....	Deep well, electric force	None
South Pasadena	8,000	4,000	4,800,000	90	Wells	All	50 lbs.	Standpipe	Distillate and electric	Direct and centrifugal	None
Stockton	40,000	40,000	4,800,000	25	Wells	.....	238 ft.	Reservoir	Steam turbine and electric	Air lift, fly-wheel direct, triplex, centr.	None
Whittier	7,200	7,200	1,063,713	50	Wells	All	.....	.....	.....	.....	.....
Colorado:											
Colorado Springs	33,500	33,000	6,785,427	15	Impounding reservoirs	.....	.....	.....	.....	.....	.....
Durango	5,000	4,800	1,450,000	1	River	None	.....	.....	.....	.....	None
Grand Junction	9,000	10,000	2,000,000	7	Impounding reservoir	None	.....	.....	.....	.....	Slow filter
Greeley	10,000	12,000	3,031,000	25	River	None	.....	.....	.....	.....	None
Longmont	5,000	5,500	1,500,000	.....	Impounding reservoir	None	.....	.....	.....	.....	None
Montrose	4,000	4,000	.....	.....	Wells	All	260 ft.	Reservoir	Electric	Deep well and triplex	None
Rocky Ford	5,000	3,500	.....	.....	Wells	All	.....	.....	.....	.....	None
Connecticut:											
Bristol	18,000	12,000	1,600,000	70	Reservoir	None	.....	.....	.....	.....	None
Danbury	20,000	19,000	1,200,000	1	Reservoir	None	.....	.....	.....	.....	None
East Hartford	18,000	16,000	1,120,000	98.5	Impounding reservoirs	None	.....	.....	.....	.....	Liquid chlorine
Hartford	144,500	144,500	9,480,000	.....	Reservoir and wells	15	.....	.....	.....	.....	Filter
Litchfield	1,200	1,200	.....	.....	Wells	.....	.....	.....	.....	.....	None
Naugatuck	15,000	12,000	2,000,000	.....	Springs and brooks	None	.....	.....	.....	.....	None
New Britain	53,300	51,500	3,795,000	98	Brooks and impounding reservoirs	None	.....	.....	.....	.....	Sand filter
Norwich	29,000	.....	3,000,000	50	Reservoirs	.....	.....	.....	Gravity	.....	None

Portland	3,300	247,500	2 Impounding reservoirs	None	.....	Standpipe	.....	.....	None
Putnam	7,100	650,000	9 River	.....	.....	250 ft.	.....	Duplex recip.	Slow sand
Southington	7,000	500,000	27 Impounding reservoirs	None	.....	.....	.....	.....	None
Suffield	4,100	100,000	100 Wells	All	.....	47 lbs.	.....	Deep well	None
Wallingford	10,500	.....	42 Impounding reservoir	None	.....	170 ft.	.....	Reciprocating	None
Westport	4,500	250,000	70 Wells	All	.....	130 lbs.	.....	Direct acting	.....
Williamantic	13,000	1,200,000	90 River	All	.....	274 ft.	.....	Vertical recip.	None
Windsor	4,178	180,927	9 Impounding reservoir	All	.....	.....	.....	.....	None
Winsted	9,000	.....	..... River	None	.....	50 lbs.	.....	.....	None
Delaware:									
Milford	3,500	1,600	..... Wells	All	.....	30 and 165	.....	Air lift and steam piston	None
District of Columbia:									
Washington	363,980	49,698,000	77.5 River	50	.....	.....	.....	Recip. vert. & hor. steam turb. centr.	Slow sand
Florida:									
Daytona	20,000b	300,000	100 Wells	All	.....	50 to 85 lbs.	Elevated tank	Kerosene	Aeration, co- agulation & softening
Live Oak	5,000	500,000	84 Wells	All	.....	35 to 45 lbs.	Elevated tank	Steam	Liquid chlorine
Pensacola	23,000	1,500,000	88 Wells	All	.....	160 ft.	Standpipe	Steam	None
St. Augustine,...	6,000	700,000	50 Wells	All	.....	160 ft.	Standpipe	Steam	None
Georgia:									
Albany	12,500	700,000	100 Wells	All	.....	65 lbs.	Reservoir	Electric	None
Americus	10,000	600,000	50 Springs and wells	All	.....	240 ft.	Standpipe	Electric and steam	None
Athens	22,000	1,400,000	100 Creek	All	.....	310 ft.	Standpipe	Electric	Rapid filters
Columbus	25,000	2,325,000	..... River	All	.....	75 lbs.	Sedimentation reservoir	Electric	Rapid filter
Commerce	2,500	140,000	80 Creek	All	.....	285 ft.	Tank	Steam	Sedimentation and rapid filters
Dublin	7,500	380,000	98 Impounding reservoir	All	.....	186 ft.	Standpipe	Steam	Reciprocating
Ft. Valley,...	3,500	150,000	95 Deep wells	All	.....	100 ft.	Standpipe	Steam	Air lift and duplex recip.
Hawkinsville	5,000	100,000	95 Wells	All	.....	170 ft.	Standpipe	Electric and steam	None
Madison	2,300	125,000	98 Spring	All	.....	70 ft.	.....	Recip. and centrifugal	Slow sand
Marietta	6,000	.....	..... Deep wells	All	.....	55 lbs.	Standpipe	Electric	None
Milledgeville	5,000	200,000	57.5 Creek	All	.....	216 ft.	Standpipe	Steam	Hypochlorite
Quitman	5,000	400,000	90 Well	All	.....	145 ft.	.....	Electric	None
Statesboro	4,000	300,000	20 Well	All	.....	225 ft.	Standpipe	Steam	None
Thomasville	8,000	275,000	100 Deep well	All	.....	100 ft.	Standpipe	Electric and steam	None
Washington	5,000	250,000	..... Creek	All	.....	250 ft.	Standpipe	Electric	Filtration
Waynesboro	3,500	100,000	95 Well	All	.....	60 lbs.	Tank	Steam	None
Idaho:									
Lewiston	8,500	1,516,167	35 River	All	.....	255 and 356 ft.	Reservoirs	Steam and electric	Sedimentation
Landpoint	3,000	.....	4 Impounding reservoir	None	.....	.....	.....	.....	None
Twin Falls	10,000	3,500,000	..... River	None	.....	150 & 190 ft.	Reservoirs	Electric	Chlorination
Weiser	4,000	300,000	100 River	All	.....	150 ft.	Reservoir	Steam	Hypochlorite
Illinois:									
Canton	12,000	350,000	90 Deep wells	All	.....	115 ft.	Direct to mains	Steam	None
Chicago	2,491,933	619,803,000	22 Lake Michigan	All	.....	225 ft. 90 ft.	Standpipe	Electric Steam	Liquid chlorine
Effingham	5,000	700,000	45 River	All	.....	.....	.....	.....	Rapid sand
Elgin	27,000	1,500,000	99 Wells	All	.....	.....	.....	.....	None

For footnotes, see page 624.

TABLE NO. 1—GENERAL—Continued.

City	Population	No. supplied with water	Average consumption	Per cent metered	Source of Supply	Per Cent of Total Supply Pumped	Head	Pumped to	Kind of Power Used	Kind of Pump	Purification Process
Illinois (Cont.):											
Farmington	3,000	1,000	40,000	....	Deep well	All	150 ft.	Reservoir and standpipe	Electric	Deep well, double acting	None
Flora	3,500	1,300	100,000	83	Deep wells	All	345 ft.	Standpipe	Electric and steam turbine	Deep well and steam turbine	None
Freeport	20,000	.....	1,394,000	.....	Wells	All twice	19 and 200 ft.	Standpipe	Steam	Reciprocating	Hypochlorite
Galesburg	25,000	15,000	1,000,000	99	Shallow and deep wells	All 2 & 3 times	15 lbs.	Reservoir	Electric and steam	Air Lift, duplex recip.	Coagulant for iron removal
Geneva	3,000	2,700	300,000	100	Deep well	All	60 lbs.	Direct to main	Electric and steam	Vertical & hor. direct acting & power	None
Harvard	3,500	2,100	150,000	100	Wells	All	70 lbs.	Standpipe	Electric	Deep well, trip-lex, centr.	Filtration
Joliet	45,000	50,000	4,500,000	100	Deep wells	All	150 ft.	.....	Steam and electric	.....	None
Kewanee	16,000	6,000	400,000	100	Deep wells	All	100 ft.	Reservoirs	Steam and electric	Air lift, recip., centr.	None
Macomb	6,500	4,500	250,000	90	Creek	All	.....	Reservoir and standpipe	Steam piston	Centr., hor. recip.	Chemical
Mattoon	13,000	.....	900,000	100	Impounding reservoir	All	150 ft.	.....	Steam and electric	Centr., comp. recip.	None
Metrose Park ...	6,000	6,000	500,000	100	Deep wells	All	110 ft.	Standpipe	Electric	Air lift, centr. duplex	None
Metropolis	6,000	3,000	350,000	....	Well	All	60 lbs.	Reservoir	Steam turbine	Air lift & centr.	None
Mt. Carmel	8,500	8,500	1,000,000	50	River	All	225 ft.	Standpipe	Steam and electric	Triple recip.	Filtration
Mt. Olive	3,601	.....	500,000	25	Impounding reservoir	All	85 ft.	Direct to mains	Steam	Hor. recip.	None
Mt. Vernon	11,000	8,500	576,471	85	.....	All	165 ft.	Standpipe	Electric	Centr.	Rapid filters
Normal	5,000	4,000	500,000	90	Deep wells	All	140 ft.	Reservoir and standpipe	Electric	Centr.	None
Oak Park	32,000	32,000	2,260,000	82	Lake Michigan	All	40 to 70 lbs.	Direct to mains	Electric	Centr.	Liquid chlorine
Paris	9,000	1,200	900,000	....	Impounding reservoir	All	80 lbs.	Standpipe	Electric	Centr.	None
Quincy	39,000	33,000	1,652,232	70	River	All, twice	55 & 245 ft.	Reservoir	Steam and electric	Hor. fly wheel, steam turbine, centr. electric, centr. duplex recip. & turbine	Rapid filter and liquid chlorine
Rochelle	4,000	.....	600,000	....	Wells	All	110 ft.	Standpipe	Steam and electric	Duplex recip. & centr.	None
Rock Island	30,000	.....	3,250,000	30	River	All	170 ft.	Reservoir	Steam	Hor. compound recip. & turbine	Rapid filter
Sandwich	2,900	2,000	.....	99	Wells	All	100 ft.	Standpipe	Electric	Hor. centr.	None
St. Charles	5,500	2,500	300,000	....	Wells	All	75 lbs.	Standpipe	Steam and electric	Deep well centr. trifugal and recip.	None
Springfield	60,076	45,000	5,464,420	99	Infiltration galleries & wells	All	232 ft.	Direct to mains	Steam	Triple flywheel	.....
Sterling	12,000	10,000	703,640	60	Deep wells	All	150 ft.	Reservoir and standpipe	Steam	Prescott comp. and Dean	None
Streator	16,000	15,500	2,250,000	39	River	All	65 lbs.	Direct to mains	Steam	Hor. recip.	Sedimentation, filtration & chlorination
Watseka	4,000	3,000	.....	100	Wells	All	52 lbs.	Standpipe	Electric and oil	Recip.	None
Waukegan	20,000	18,000	5,000,000	20	Lake	All	80 to 100 lbs.	Direct to mains	Steam	Recip.	Hypochlorite
Indiana:											
Attica	4,500	4,500	427,500	None	Deep wells	All	98 lbs.	Reservoir	Steam	Vert. comp. duplex cond. Recip.	None
Auburn	5,000	3,800	750,000	None	Wells	All	45 lbs.	Direct to mains	Steam	Recip.	Filtration
Batesville	3,000	.....	75,000	95	Reservoirs	All	40 lbs.	Standpipe	Electric and steam	Triplex power	None
Bedford	12,000	.....	1,250,000	100	River	All	300 ft.	Reservoir	Electric	Centr.	Sedimentation
Bluffton	5,000	4,300	300,000	100	Deep wells	All	140 ft.	.....	Steam	Hor. recip., electr. centr. air lift	None
Brazil	12,000	10,000	500,000	100	Wells	All	40 lbs.	Reservoir	Steam piston	.....	Filtered
Cinton	13,000	13,000	600,000	15	Wells	All	45 lbs.	Direct	Steam	Horizontal Triple horizon-	None
Crawfordsville ..	10,000	6,500	600,000	33	.....	All	.....	.....	.....	.....	None
Delhi	3,000	2,000	100,000	75	Springs	All	20 ft.	Standpipe	Steam	Duplex recip.	None

Elwood	12,000	.....	800,000	46 Wells	All	102 ft.	Reservoir	Steam	Hor. recip.	None
Fairmount	2,506	.....	200,000	95 Wells	All	8 ft.	Direct	Electric	Centrifugal	None
Gary	55,000	45,000	4,000,000	None	All	135 ft.	Tank	Electric	Centrifugal	Liquid chlorine
Gas City	3,000	1,200	150,000	69 Wells	All	68 & 95	.....	Steam	Hor. direct	.....
Goshen	10,000	2,150	1,086,000	69 Wells	All	150 ft.	Standpipe	Steam	Hor. cross	None
Greensfield	5,000	.....	600,000	12 Deep wells	50	40 to 100 ft.	Reservoir	Steam and gas	comp. high	None
Greensburg	5,240	4,000	600,000	100 Wells	All	.....	Direct	.....	duty	None
Kendallville	6,000	3,500	250,000	24 Wells	All	50 to 60 lbs.	Direct	Steam	Air lift	None
Lafayette	25,000	.....	3,506,990	30 Wells	All	179 ft.	Reservoir	Steam	Comp. duplex	None
La Porte	13,500	.....	1,707,000	65 Wells	All	100 to 160 lbs.	Reservoir	Electric and	horizontal	None
Lebanon	7,000	.....	350,000	25 Wells	All	120 ft.	Standpipe	Steam and	Comp. recip.	None
Linton	8,000	.....	600,000	25 Wells	All	190 ft.	Direct	electric	.....	None
Logansport	22,000	18,000	5,000,000	..... River	All	60 to 100 lbs.	Direct	Steam and el-	Comp. duplex	.....
Mishawaka	17,000	.....	1,237,000	100 Wells	All	70 lbs.	Direct	Steam	Recip.	Filtration and
Montpelier	2,700	1,000	150,000	75 Wells	All	45 ft.	Direct	Electric and	Hor. cross	liquid chlo-
New Castle	15,000	13,000	1,300,000	7 Wells	All	.....	Reservoir	Steam	comp. fly-	rine
Noblesville	7,000	.....	515,410	10 Wells	All	9 ft.	Reservoir	Electric	Centr. & du-	None
N. Manchester	3,000	2,100	175,000	95 Wells	All	100 to 142 ft.	Standpipe	Electric	plex recip.	None
Peru	15,000	11,500	1,100,990	27 Wells	All	42 lbs.	Reservoir	Steam	Air lift and	None
Plymouth	5,000	.....	100,000	100 Wells	All	.....	Reservoir	Electric and	gross comp.	None
Portland	5,132	4,000	800,000	65 Wells	All	60 lbs.	.....	Steam	Recip. and	None
Richmond	30,000	28,000	2,193,373	..... Infiltration	All	180 ft.	Reservoir	Steam	centr.	None
Rockport	3,000	2,500	.....	..... Deep wells	All	125 ft.	Standpipe	Steam and	Centrifugal	None
Rushville	6,000	4,200	.....	100 Wells	All	10 ft.	Reservoir	Electric	Air lift and	None
Seymour	7,000	4,200	.....	40 River	All	50 to 80 ft.	Standpipe	Steam	Hor. direct	Rapid filters
South Bend	68,000	60,000	5,000,000	30 Wells	All	86 lbs.	.....	Steam and	Hor. direct	None
Sullivan	6,000	.....	.....	100 Reservoir	All	100 ft.	Standpipe	hydraulic	acting and	None
Terre Haute	65,000	37,000	4,723,720	63 River	All	160 ft. c.	Direct	Steam	power	None
Union City	5,000	4,750	295,000	80	All	.....	Direct	Steam	.....	Sedimentation,
Vincennes	17,000	10,000	2,000,000	..... River	All	70 lbs.	Standpipe	Steam	Triple vert.	filters
W. Terre Haute	5,000	1,000	46,800	None Wells	All	40 to 70 lbs.	Direct	Gas	comp. vert.	chlorine
Albia	5,120	2,000	360,000	100 Wells	All	55 lbs.	Standpipe	Oil	cond. fly-	.....
Ames	5,000	.....	.....	..... Wells	All	120 lbs.	Direct	Electric	Direct acting	None
Atlantic	5,100	5,000	.....	75 Wells	All	50 and 380 ft.	Standpipe	Steam	Recip.	Hypochlorite
Boone	13,000	.....	1,000,000	21 River	All twice	100 lbs.	Direct	Steam	Comp. fly wh'l	Sedimentation,
Burlington	24,324	.....	2,356,844	25 Wells	All	100 lbs.	Standpipe	Steam	acting	filtration and
Cedar Falls	6,250	7,500	625,000	25 Wells	All	100 lbs.	Standpipe	Steam	Hor. cross	liquid chlor-

For footnotes, see page 624.

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For footnotes, see page 624.

TABLE NO. 1—GENERAL—Continued.

City	Population	No. supplied with water	Average con- sumption	Per cent metered	Source of Supply	Per Cent of Total Supply Pumped	Head	Pumped to	Kind of Power Used	Kind of Pump	Purification Process
Massachusetts (Cont.):											
Fall River.....	124,700	124,011	6,000,000	100	Lake	All	198 ft.	Standpipe	Steam	Direct acting flywheel cen- trifugal	None
Fitchburg	40,000	39,000	4,500,000	....	Brooks and ponds	None	.....	.....	.....	.....	None
Framingham	16,000	14,500	864,928	81	Infiltration gallery and met. W. W.	All	217 ft.	Standpipe	Steam piston	Hor. cross comp.	Filtration
Franklin	6,000	5,200	300,000	100	Wells	All	210 ft.	Standpipe	Steam piston	Hor. direct acting, hor. cross comp. fly wheel, vert. triple.	None
Gloucester .....	.....	26,000	1,361,804	20.5	Impounding reservoirs	All	140 ft.	Reservoir	Steam piston	Vertical, hor.	None
Greenfield	13,000	13,000	1,387,511	10	Brooks	In droughts	240 ft.	Reservoir	Electric	Hor. recip.	filter
Holyoke	60,000	59,800	6,120,000	....	Impounding reservoirs	None	.....	.....	.....	.....	None
Hudson	6,750	6,000	251,179	95	Lake	None	None	Standpipe	Steam piston	Vertical	.....
Lawrence	99,000	99,000	4,000,000	68	River	All	154 ft.	Standpipe	Steam piston	Bucket and plunger, du- plex vert. wheel, fly- comp. fly- wheel, centr.	Slow sand
Lenox	3,120	3,000	350,000	95	Reservoir	None	.....	Reservoir and standpipe	Steam piston, steam turb., electric	.....	Long storage
Lynn and Saugus	103,000	103,000	7,065,310	56	River and ponds	All	156 and 250 ft.	.....	.....	.....	.....
Mansfield	5,500	4,500	500,000	....	Well	All	222 ft.	Reservoir	Steam	Cross comp. fly wheel	None
Maynard	6,700	6,000	293,177	....	Pond	All	200 ft.	Reservoir	Steam piston	Direct acting	None
Medway	2,840	2,000	94,403	....	Wells	All	100 lbs.	Standpipe	Kerosene	.....	None
Milton	8,933	8,750	371,300	100	Metropolitan W. W.	.....	.....	.....	.....	.....	.....
Monson	5,000	3,500	8,530,000	95.7	Wells	None	188 ft.	Reservoir	Steam piston	Vertical recip.	None
New Bedford	113,000	112,120	1,080,000	18	River, springs, wells	All	160 ft.	Standpipe	Steam piston	Hor. Recep.	Slow sand
Newburyport	16,000	15,000	3,098,787	63.5	Ground water	All	270 ft.	Reservoir	Steam	Vertical hor.	None
Newton	45,000	44,800	3,011,000	10	Brooks h	.....	200 ft.	Direct	Steam	Comp. recip.	None
North Adams	22,035	22,000	2,871,000	50	Mt. streams	.....	220 ft.	Standpipe	Steam	Hor. cross comp. fly wheel	None
Northampton	21,654	20,000	450,000	100	Wells	All	.....	.....	.....	.....	None
North Attleboro ..	5,562	9,200	.....	.....	.....	.....	.....	.....	.....	.....	.....
North Easton	4,000	600	125,000	100	Well	All	173 lbs.	Standpipe	Steam piston	Hor. Worth- ington & Warren	None
Norton	2,150	1,300	84,800	1.3	Wells	All	257 ft.	Tank	Oil	Vert. triplex	None
Orange	5,000	4,370	175,000	100	Impounding reservoir	All	300 ft.	Reservoir	Hydraulic	Dean	None
Oxford	3,000	.....	100,000	....	Wells	All	125 lbs.	Standpipe	Internal Com- bustion	Triplex power	None
Peabody	18,850	17,200	3,012,498	44	Ponds	All	160 ft.	Reservoir	Steam piston	Triple duplex cross comp.	None
Pepperell	3,500	.....	150,000	75	Wells	All	116 lbs.	Standpipe	Oil, electric	Recip. vert., centr.	Rapid filter
Randolph	4,800	.....	400,874	....	Pond	All	300 ft.	Standpipes	Steam	Direct acting, fly wheel	Screening
Reading	6,855	6,750	244,881	93.6	Infiltration gallery and well	All	219 ft.	Standpipe	Steam and Electric	Comp. duplex, deep well	Rapid filtration
Saugus	10,394	8,000	400,000	35	Reservoir	.....	.....	.....	.....	.....	.....
Somerville	90,000	90,000	6,183,600	73	Metropolitan W. W.	.....	.....	.....	.....	.....	.....
So. Hadley Falls.	5,000	3,800	380,000	7	Impounding reservoirs	None	.....	.....	.....	.....	.....
Spencer	6,000	4,500	240,000	95	Lake	In droughts	38 lbs.	Standpipe	Gasoline	Triplex power	None
Springfield	105,780	104,572	11,260,000	70.7	River and im- pound- ing reservoir	None	.....	.....	.....	.....	Sedimentation and slow fil- tration
Swampscott	7,345	7,345	445,400	100	Metropolitan water works	.....	.....	.....	.....	.....	.....
Taunton	36,161	36,000	2,463,416	58	Ponds	All twice	.....	Reservoir	Steam piston	Vertical and horizontal	None
Turners Falls.....	7,000	7,000	800,000	8	Lake	All	275 ft.	Reservoir	Steam piston	Direct acting	None
Walpole	5,500	5,200	740,526	80	Wells	All	170 ft.	Standpipe	Steam	Hor. comp. du- plex	None
Waltham	31,700	30,700	1,384,584	53.1	Wells	All	226 & 236	Reservoir and standpipe	Steam piston	Hor. direct act- ing	None

Weymouth	15,000	14,900	917,700	33.1 Pond	42	140 ft.	Standpipe	Steam piston	Comp. duplex	None
Winchester	5,908	210,000	210,000	49.3 Wells	All	140 lbs.	Reservoir	.....	Recip.	None
Winthrop	12,500	12,500	707,800	100 Metropolitan water works	.....	.....	.....	.....	.....	None
Worcester	178,547	178,437	14,141,583	73.5 Impounding reservoirs	None	.....	.....	.....	.....	None
Michigan:										
Albion	10,000	6,000	850,000	2 Wells	All	175 ft.	Standpipe	Steam piston and electric	Hor. comp. duplex flywheel, electric cent.	None
Allegan	4,000	.....	750,000	.... Wells	All	125 ft.	Direct	Hydraulic d	Triplex, double acting	None
Alpena	12,600	12,600	1,915,000	12 Lake	All	30 lbs.	Direct	Steam piston	Hor. comp.	Liquid chlorine
Battle Creek	33,000	25,000	2,500,000	.... Lake and wells	All	110 and 210 ft.	Standpipe	Steam and electric	Hor. recip., direct centr.	Liquid chlorine
Belding	5,000	.....	176,543	.... Wells	All	186 ft.	Tank	Steam piston	Cross, comp. & duplex	.....
Bessemer	4,866	3,763	250,000	.... Wells	All	70 & 110	Direct	Steam	Direct acting	None
Big Rapids	4,912	3,500	1,900,000	.... 1 River	All	160 ft. f	Direct	Hydraulic	Hor. duplex vert. triplex	None
Coldwater	6,600	.....	980,000	.... Wells	All	40 lbs.	Direct	Steam	Duplex and centrifugal	None
Charlotte	5,000	3,500	800,000	25 Wells	All	250 ft.	Standpipe	Steam piston	Reciprocating	None
Crystal Falls	3,700	4,500	332,000	.... River	All	140 ft.	Direct	Hydraulic	Reciprocating	None
Dowagiac	5,000	.....	.....	100 Wells	All	.....	.....	Steam piston	Cross comp. fly wheel, hor. duplex	None
Essexville	1,503	.....	45,000	50 Bay City W. W.	All	.....	.....	.....	.....	None
Flint	80,000	.....	7,000,000	100 River	All	150 ft.	Direct	Steam turbine, steam piston	Centr., hor. comp. vert. and hor., centr.	Rapid filtration
Grand Rapids ..	130,000	113,000	10,263,000	92 River	All	138 and 230 ft.	Reservoir and standpipe	Steam piston and electric	Recip. vert. and hor., centr.	Softening filter, sterilize
Hastings	5,000	4,500	318,533	35 Wells	All	60 and 100	Direct	Steam turbine	Centr.	None
Highland Park ..	37,877	40,177	9,000,000	50 Lake	All	120 and 100 ft.	Standpipe and reservoir	Electric d	Turbo-centr.	None
Holland	12,000	10,158	849,763	58 Shallow wells	All	160 ft.	Standpipe	Electric d	Centr.	None
Houghton	6,700	5,700	350,000	100 Springs	40	87 lbs.	Reservoir	Electric	Triplex power	None
Ionia	6,000	5,500	711,000	30	All	120 ft.	Direct	Steam piston	Hor. recip.	None
Ishpeming	13,000	13,000	1,500,000	80 Lake	All	.....	.....	Steam piston	Direct acting	Copper sulphate
Jackson	43,000	38,000	3,111,000	55 Wells	All	160 ft.	Direct	Steam	Hor. high duty cross comp.	None
Ludington	10,000	.....	1,058,000	25 Lake	All	162 and 231 ft.	Standpipe	Steam piston and electric	Recip. and centr.	Hypochlorite
Manistee	12,360	10,000	883,910	64 Wells	All	.....	.....	Steam piston	Recip. and centr.	None
Marine City	4,000	3,800	1,250,000	.... River	All	250 ft.	Direct	Electric d	Centr.	Hypochlorite
Marquette	13,000	12,750	2,210,000	52 Lake	All	60 to 80 lbs.	Direct	Electric d	Hor. direct	Liquid chlorine
Mt. Clemens	16,000	16,000	900,000	95 Wells	All	.....	.....	Steam piston	Hor. direct	None
Muskegon	41,000	.....	4,348,832	.... Lake	All	240 ft.	Direct	Steam	Platt & Holley acting	None
Norway	4,975	.....	500,000	.... Lakes	20	.....	Reservoir	Steam	Duplex direct, triplex power	.....
Onaway	3,000	2,000	120,000	.... Wells	All	150 ft.	Reservoir	Steam piston	Air lift and hor. recip.	None
Pawpaw	1,800	.....	450,000	100 Reservoir	All	142 ft.	Standpipe	Electric and steam	Centr. comp. duplex	None
Sturgis	6,173	6,000	2,152,000	99 Deep wells	All	140 ft.	Direct	Electric	Centr.	None
Traverse City ..	12,500	.....	.....	50 Lake	All	65 and 100	Direct	Steam	Cross comp.	Liquid chlorine
Yale	1,350	1,000	.....	.... Wells	All	.....	Tank	Electric d	Vertical	None
Minnesota:										
Alexandria	3,500	2,000	250,000	None Deep well	All	50 lbs.	Tank	Electric d	Deep well, triplex	None
Brainerd	10,000	8,750	150,000	.... River	All	135 ft.	Standpipe	Steam	Direct acting	Liquid chlorine
Demidit	6,000	3,500	143,000	100 Wells	All	265 ft.	Standpipe	Electric d	Triplex power	None
Cloquet	8,100	5,400	.....	100 Impounding reservoirs	All	.....	.....	Electric	Centr.	None
Duluth	98,000	92,000	8,022,251	90.2 Lake	98	290 ft.	Reservoir	Electric	Centr.	Liquid chlorine
Eveleth	9,000	9,000	1,250,000	.... Lake	All	450 ft.	Standpipe	Steam piston	Recip.	None
Fairmont	5,000	3,200	400,000	.... Lake	All	195 lbs.	Reservoir	Electric	Centr.	None
Faribault	11,000	6,650	297,260	34 Deep wells	All	125 lbs.	Reservoir	Electric and steam	Direct centr. cross comp. flywheel	None
Lake City	4,000	3,400	150,000	100 Deep wells	All	85 lbs.	Reservoir	Steam	Triplex, cross comp.	None
Melrose	3,000	.....	200,000	.... River	All	65 lbs.	Standpipe	Steam and electric	Triplex power and duplex	None
New Ulm	8,000	.....	275,000	100 Deep wells	All	75	Reservoir	Steam piston	Direct acting	None
Northfield	2,650	.....	220,000	100 Well	All	210 ft.	Standpipe	Electric	Triplex	None
Owatonna	6,646	4,430	2,500,000	.... Deep wells	All	70 lbs.	Standpipe	Steam piston	Direct acting	None

For footnotes see page 624.

TABLE NO. 1—GENERAL—Continued.

City	Population	No. supplied with water	Average consumption	Per cent metered	Source of Supply	Per Cent of Total Supply Pumped	Head	Pumped to	Kind of Power Used	Kind of Pump	Purification Process
Minnesota (Cont.):											
Rochester	12,000	11,000	1,000,000	....	.....	85	85 lbs.	Standpipe	Steam and electric	Comp. duplex centrifugal	None
St. Paul	272,000	214,000	14,944,463	64.1	Lakes & wells	58	165 ft.	Reservoir	Steam and electric	Triple vert. centrifugal	None
St. Peter	4,200	1,570	98,490	80	Deep well	All	92 lbs.	Standpipe	Electric	Centrifugal	.....
Staples	3,000	1,000	.....	100	Wells	All	40 lbs.	Standpipe	Steam	Deep well, direct acting	None
Stillwater	11,000	5,500	300,000	None	Spring and well	33	222 ft.	3 Standpipes	Electric d	3-stage centr.	None
Thief River Falls	6,000	3,000	200,000	100	Deep wells and river	All	120 ft.	Tank	Electric	Triplex power, deep well	None
Two Harbors	5,000	.....	1,500,000	50	Lake	All	80 lbs.	.....	Steam piston	Direct acting	None
Virginia	15,000	15,000	7,500,000	.....	Wells	All	100 ft.	Tank	Compressed air	.....	None
Willmar	5,000	3,500	125,000	100	Wells	All	40 lbs.	Reservoir	Steam and electric	Duplex recip., triplex power	None
Mississippi:											
Corinth	4,500	3,500	500,000	10	Wells	All	100 ft.	Standpipe	Steam piston	Direct acting, deep well	None
Greenwood	8,000	25,500	1,750,000	None	Deep wells	All	100 ft.	Standpipe	Steam piston	Hor. recip.	None
Jackson	29,161	25,500	2,750,000	35	River	All	.....	Direct	Steam, electric	Cross comp., centr.	Rapid filtration
Lexington	3,000	.....	140,000	1	Deep wells	.....	137 ft.	Standpipe	Internal combustion	Triplex power	None
Natchez	12,000	3,600	683,875	92.5	Deep well	All twice	300 ft.	Standpipe	Steam piston	Air lift, hor. recip.	None
Pascagoula	3,900	.....	140,000	12	Deep well	All	120 ft.	Standpipe	Electric	Centr.	None
Tupelo	9,000	2,700	507,250	100	Deep wells	All	72	Standpipe	Steam piston	Air lift, hor. recip.	None
Water Valley	7,000	.....	3,500,000	100	Wells	All	80 lbs.	Standpipe	Steam piston	Comp., centr.	None
Missouri:											
Albany	2,500	1,500	60,000	.....	River	All	40	Reservoir	Steam piston	Direct acting	Sedimentation
Butler	3,000	2,400	130,700	97.5	River	All twice	235	Standpipe	Electric	Centr.	Rapid filter
Carrollton	3,800	.....	300,000	20	Wells	All	180 ft.	Standpipe	Steam piston	Comp. duplex	None
De Soto	6,000	3,000	.....	100	Wells	All	.....	Reservoir	Steam	.....	None
Farmington	3,000	1,750	60,000	100	Deep wells	All	450	Standpipe	Electric and steam	Air lift, deep well	None
Fulton	5,500	3,500	175,000	78	Deep well	All	220 ft.	Reservoirs	Steam and electric	Air lift, deep well, centr.	None
Hannibal	20,000	.....	1,500,000	20	River	All	260 ft.	Reservoir	Steam piston	Vert. recip.	Sedimentation
Macon	4,000	2,700	440,000	33	River	All twice	140 lbs.	Standpipe	.....	Centr.	Rapid filter
Mexico	6,500	4,000	400,000	67	Impounding reservoir and wells	All	110 lbs.	Standpipe	Electric	Centr.	.....
Rich Hill	3,500	750,000	97,600,000	.....	Deep wells	All	50 lbs.	Standpipe	Steam	Air lift, recip.	Aeration
St. Louis	755,000	.....	.....	30	River	All twice	168 to 215 ft.	Reservoir and standpipe	Steam	Comp. vert., triple vert., turb. centr.	Sedimentation and rapid filtration
Slater	3,800	.....	54,000	....	Lake	All	270 lbs.	Tank	Electric	Vert. triplex, centr.	Rapid filtration
Trenton	7,500	2,500	750,000	100	River	All	125	Reservoir and standpipe	Steam piston	Comp. duplex	Rapid filtration
Washington	5,000	2,500	325,000	55	River and deep wells	All	200 ft.	Standpipe	Steam and electric	Direct acting and centr.	None
Webb City and Cartersville	23,500	.....	1,000,000	90	Deep wells	All	.....	Standpipe	Steam and electric	.....	.....
West Plains	3,500	1,350	60,000	95	Wells	All twice	250 ft.	Reservoir and standpipe	Electric	Deep well, triplex power	None
Montana:											
Anaconda	15,000	.....	3,990,000	None	Mt. lakes and streams	None	.....	.....	.....	.....	None
Billings	14,000	17,000	2,831,168	27.3	River	All	200 ft.	Reservoir	Electric	Centr.	Filter and sterilized
Deer Lodge	4,200	.....	.....	....	Mt. streams and springs	None	.....	.....	.....	.....	None
Glendine	5,000	5,000	600,000	....	River	All	92 lbs.	Reservoir	Electric	Centrifugal	Rapid filter, liquid chlor.
Great Falls	35,000	.....	6,500,000	....	River	All	235 ft.	Standpipe	Electric	Centr. triplex	Liquid chlorine
Havre	6,000	.....	600,000	28	Wells	All	260 ft.	Standpipe	Electric	Vert. triplex power	None
Kalispell	5,500	5,000	1,150,000	60	Well	100	148 ft.	Reservoir	Electric d	Double suction volute	None
Libby	2,000	.....	.....	None	Creek	None	.....	.....	Steam piston, electric	Hor. recip.	None
Livingston	4,000	6,000	1,544,463	..	Wells	All	179 ft.	Reservoir	.....	.....	Filters

TABLE NO. 1—GENERAL—Continued.

City	Population	No. supplied with water	Average consumption per cent metered	Source of Supply	Per Cent of Total Supply Pumped	Head	Pumped to	Kind of Power Used	Kind of Pump	Purification Process
New Mexico:										
Las Vegas.....	8,000	8,000	1,000,000	50 River	None	.....	.....	.....	.....	None
Raton.....	5,000	5,000	1,000,000	12 Impounding reservoir	None	.....	.....	.....	.....	Rapid filter
New York:										
Albany.....	110,000	108,000	21,559,000	35 River	All	330 ft.	Reservoirs	Steam piston	Vert. direct acting	Double filtration and liquid chlorine
Amityville.....	3,000	2,000	160,000	.... Wells	All	56 lbs.	Standpipe	Electric and inter. comb.	Triplex single acting, rotary direct	None
Amsterdam.....	35,000	33,000	7,500,000	9 Reservoirs	None	.....	.....	.....	.....	.....
Auburn.....	37,335	38,275	6,690,763	10 Lake	All	60-100 lbs.	Direct	.....	Hor. direct duplex	Chlorine
Beacon.....	11,600	8,000	320,000	100 Impounding reservoirs	None	.....	.....	.....	.....	Chlorine
Binghamton.....	55,901	54,000	6,467,215	y River	All	164-270 ft.	Reservoir	Steam and electric	Reciprocating	Filtration
Chatham.....	2,250	2,250	360,000	67 Wells	All	115 ft.	Reservoir	Steam and electric	Triplex power, Deane	None
Cold Spring.....	2,350	2,350	.....	70 Impounding reservoir	None	.....	.....	.....	.....	None
Corning.....	15,197	14,993	1,200,000	99.5 Impounding reservoir	All	225 ft.	Reservoir	Gas	Hcr. triplex, vertical	Liquid chlorine
Cortland.....	12,346	11,700	1,238,565	26 Springs	All	70 lbs.	Standpipe	Steam piston	Hor. recip.	None
Dolgeville.....	3,503	3,475	200,000	none Creek	.....	.....	.....	.....	.....	None
East Syracuse.....	4,000	4,000	200,000	100 Impounding reservoir	None	.....	.....	.....	.....	Liquid chlorine
Elmira.....	45,000	50,000	4,250,000	95 River and reservoir	60	150 ft.	Reservoir	Steam turbine and electric	Centrifugal	Rapid filter & liquid chlorine
Frankfort.....	4,500	4,200	.....	90 Impounding reservoir	None	.....	.....	.....	.....	None
Glens Falls.....	16,894	16,700	3,000,000	34 Impounding reservoir	In droughts	243 ft.	Direct	Electric	Centr.	None
Gloversville.....	22,000	20,000	1,860,000	100 Springs and mt. streams	None	.....	.....	.....	.....	None
Hempstead.....	6,503	6,100	500,000 aa	.... Wells	All	110 ft.	Standpipe	Steam	Comp. duplex piston	None
Hoosic Falls.....	5,600	5,000	900,000	.... Wells	All	110	Standpipe	Steam	Gould power, Knowles	None
Horner.....	2,803	1,800	250,000	20 Deep wells	All	210 ft.	Standpipe	Steam	Horizontal	None
Hudson, Falls.....	6,500	6,500	600,000	20 Springs	All	75 lbs.	Standpipe	Steam, electric and gasoline	Hor. duplex, Triplex power, 4-stage centr. horizontal	Liquid chlorine
Ithaca.....	22,000t	.....	2,250,000	45 Two impounding reservoirs	45	340 & 490	Standpipes	Electric	Triplex power, Recip. vert. & horizontal	Rapid filter & chlorine
Jamestown.....	38,000	40,000	2,500,000	65 Wells	All twice	245	Reservoir	Steam piston	.....	None
Johnstown.....	10,447	10,300	.....	.. Springs	None	.....	.....	.....	.....	Rapid filters
Kingston.....	27,000	.....	4,500,000	.. Impounding reservoir	None	.....	.....	.....	.....	Liquid chlorine
Lancaster.....	5,094	.....	500,000	100 Lake	All	100 lbs.	Reservoir	Steam piston and steam turbine	Horizontal	None
Liberty.....	2,350	.....	115,000	95 Reservoir	60	332 ft.	Reservoir	Steam	Direct acting	Liquid chlorine
Little Falls.....	13,200	13,200	3,350,000	25.2 Mountain streams and springs	None	.....	.....	.....	.....	.....
Malone.....	7,542	7,542	1,440,000	25 Springs	None	.....	.....	.....	.....	None
Mt. Kisco.....	3,000	3,000	.....	90 Impounding reservoir	25	200 ft.	Reservoir	Electric	Triplex power comp., hor. duplex high duty hor.	None
Mt. Vernon.....	37,780	37,780	2,750,000	100 River	All	300 ft.	Standpipe	Steam piston	Hor. cross duplex comp. hor.	Filtration and liquid chlorine
Newark.....	6,500	6,000	.....	.. Wells and springs	All	200 ft.	Standpipe	Steam piston	Air lift & centr.	.....
Newburgh.....	30,000	29,000	5,000,000	.... Reservoir	35	160 ft.	Reservoir	Electric	Centrifugal	Liquid chlorine
New Rochelle.....	.....	.....	3,500,000	100 Reservoirs and wells	40	.....	Standpipe	Steam and electric	Hor. Centr.	Hypochlorite
Olean.....	18,000	15,000	2,000,000	100 Wells	All	255 ft.	Reservoir	Electric and steam	Centr. & vert.	None
Oneonta.....	11,000	.....	1,500,000	100 Impounding reservoir	None	.....	.....	.....	.....	Rapid filter

Ossining	11,400	10,800	486,570	90	Impounding reservoir	All	140 lbs.	Reservoirs	Steam piston	Fly wheel, duplex comp. acting	Liquid chlorine
Peekskill	17,000	16,000	3,500,000	80	Creek	All	160 lbs.	.....	Steam piston	Horizontal	Slow filtration
Penn Yann	5,000	5,000	600,000	30	Lake	All	312 ft.	Reservoir	Steam piston	Horizontal	None
Port Jervis	10,300	9,000	3,000,000	50	Impounding reservoirs	15	160 ft.	Direct	Steam	Hor. comp.	Liquid chlorine
Potsdam	4,500	950	800,000	.....	.....	All	60 lbs.	Direct	Steam and hydraulic	Triplex power, ton direct acting	None
Poughkeepsie	33,000	33,000	2,700,000	100	River	All	268 ft.	Reservoir	Steam piston	Triple direct	Sedimentation, filters and sterilization
Rome	25,000	25,000	6,000,000	..	Creek	None	170 ft.	Reservoir	Inter. comb. and electric	Centr.	Chlorine
Salamanca	9,000	9,000	1,800,000	..	Wells and impounding reservoir	50	.....	.....	.....	.....	None
Schenectady	96,184	97,144	11,150,000	72	Shallow wells	All	104 lbs.	Reservoir	Electric	Vert. centr. Comp. duplex	None
Seneca Falls	7,000	5,000	1,000,000	5	Lake	All	85 to 100 lbs.	Standpipe	Steam	Comp. duplex	Rapid sand
Sidney	2,800	.....	336,000	None	Impounding reservoirs	None	.....	.....	.....	.....	Slow sand
Solvay	6,000	6,000	500,000	100	Lake	All	125 lbs.	Reservoir	Electric	Recip. centr. Vert. comp. duplex	Chlorine
Southampton	4,000	4,000	312,671	100	Wells	All	65 lbs.	Direct	Steam	.....	None
Syracuse	153,500	152,000	20,500,000	60	Lake	None	135 lbs.	Reservoir	Steam piston	Hor. recip.	None
Tarrytown	5,790	7,000	750,000	100	Impounding reservoir	All	.....	.....	.....	.....	Rapid filter and liquid chlorine
Tonawanda	9,000	9,000	5,750,000	10	River	All	.....	Reservoir	Steam piston	Horizontal	None
Troy	75,000	60,000	22,000,000	99	Impounding reservoir and impounding reservoirs	None	.....	.....	.....	.....	None
Utica	100,000	100,000	12,000,000	5	Lake	All	150 ft.	Tank	Electric	Power	Liquid chlorine
Waterloo	4,500	3,000	450,000	.....	Impounding reservoir	None	.....	.....	.....	.....	Rapid filter and liquid chlorine
Waverly	5,155	5,000	591,000	100	River and impounding reservoir	.....	185 ft.	Reservoir	Steam	Hor. cross comp., vert. triple	Slow filtration and chlorine
Yonkers	91,000	91,000	9,449,764	.....	.....	.....	.....	.....	.....	.....	.....
North Carolina:											
Durham	25,000	.....	2,750,000	..	Rivers	All	110 lbs.	Reservoir	Steam piston	Horizontal	Filter and hypochlorite
Edenton	3,000	3,000	100,000	20	Wells & river	All	40 lbs.	Standpipe	Steam	Hor. duplex	None
Gastonia	12,000	6,000	286,000	90	Creek	All twice	320	Standpipe	Electric	Centr.	Rapid filter
Henderson	6,000	4,500	400,000	100	Impounding reservoir	All	204 ft.	.....	.....	.....	Rapid filter
Lenoir	4,500	2,250	200,000	98	Impounding reservoir	None	.....	.....	.....	.....	None
Monroe	6,000	5,000	100,000	90	Wells	All	60 lbs.	Reservoir	Electric	Air lift, centr. plex	None
Oxford	4,000	2,500	85,000	43.3	Deep wells	All	150 & 130 ft.	standpipe	Electric and gasoline steam	Deep well, tri-plex	None
Raleigh	25,000	20,000	2,100,000	.....	Impounding reservoir	All	219.5	Tank	Electric and steam	Centr., hor. comp. duplex cond., cross cond. Corliss cond.	Sedimentation and filtration
Rocky Mount											
Statesville	14,000	12,000	600,000	90	River	All	125 ft.	Standpipe	Steam	Hor. Comp. duplex	Filtration and chlorine
Thomasville	7,500	.....	600,000	.....	Creek and springs	All	115 lbs.	Standpipe	Steam	Hor. high duty, centr.	Filter and chlorine
Wilmington	5,500	4,500	200,000	80	Wells	All	.....	Reservoir and standpipe	Electric	Deep well	None
Winston-Salem ..	30,000	22,000	300,000	.....	River	All	70 lbs.	.....	Steam piston	Centr., triple recip.	Rapid filter
.....	35,000	.....	3,000,000	80	Impounding reservoir	All	300 ft.	.....	Steam	Flywheel	Rapid filter
North Dakota:											
Devil's Lake	5,000	3,500	.....	..	Well	All	35 lbs.	Standpipe	Steam	Recip. & centr.	None
Fargo	25,000	25,000	2,000,000	60	River	All	100 ft.	Direct	Steam	Flywheel	Filtration
Jamestown	7,070	4,000	506,000	100	Wells	All	154 ft.	Standpipe	Electric	Centr., triplex	None
Mandan	5,385	.....	90,000	100	River	All	200 ft.	Reservoir	Electric	2-stage centr.	None
Valley City	4,606	.....	225,000	100	Well	All	130 ft.	Standpipe	Electric	Vert. triplex, centr.	None
Wahpeton	3,300	3,300	240,000	.....	River	All	38-52 lbs.	Standpipe	Electric and steam	Centr. and vert.	Hypochlorite
Williston	6,000	.....	300,000	75	River	All	60	Reservoir and standpipe	Electric	Recip. & centr.	Filter and hypochlorite

For footnotes see page 624.

TABLE NO. 1—GENERAL—Continued.

City	Population	No. supplied with water	Average consumption per cent metered	Source of Supply	Per Cent of Total Supply Pumped	Head	Pumped to	Kind of Power Used	Kind of Pump	Purification Process
Ohio:										
Archbold	1,200	500	3,029,559	Well	All	60 lbs.	Tank	Electric	Deep well	.....
Ashtabula	22,500	22,500	800,000	98 Lake	All	220 ft.	Reservoir and standpipe	Steam	Direct acting	Rapid filter
Athens	7,000	.....	800,000	15 Wells	All	120 lbs.	Reservoir	Steam and electric	Recip. centr.	None
Barnesville	4,500	2,500	250,000	100 Impounding reservoir	All	130 lbs.	Direct	Steam	Comp. duplex	Rapid filter
Batavia	1,050	.....	45,000	95 Wells	All	125 lbs.	Reservoir	Steam piston	Duplex	Coagulation
Bryan	4,000	3,250	500,000	.....	All	200 ft.	Direct	Electric	2-stage turbs.	None
Cambridge	13,000	.....	1,950,000	None Creek	All	.....	Standpipe	Steam	Cross comp. horizontal	Rapid filter
Chillicothe	15,000	12,500	850,000	25 Wells	All	232 ft.	Reservoir	Steam	Comp. condens-ing hor. du-plex	None
Cincinnati	415,000	425,000	52,432,903	51.2 River	All	80, 200 & 230 lbs	Reservoir and standpipes	Steam	Vert. triple fly-wheel	Sedimentation, rapid filter & chlorine
Cleveland	710,000	785,000	94,500,000	99 Lake	All	80, 100 & 200 lbs	3 reservoirs & standpipe	Steam piston, steam tur-bine, electric	Vert. triple fly-wheel, hor. duplex direct, centr.	None
Conneaut	10,000	.....	1,500,000	59 Lake	All	225 ft.	Standpipe	Steam piston & steam tur-bine	Recip. hor., centr.	Rapid filter
Coshocton	12,000	11,500	1,500,000	.. Wells	All	285 ft.	Reservoir	Steam piston	Vert. and hor.	None
Dayton	145,000	135,000	12,150,000	55 Wells	All	70 & 130 lbs.	Standpipes	Steam piston, steam tur-bine, electric	Vert. and hor. direct acting, power and centrifugal	None
Delaware	10,400	9,000	1,000,000	85 Wells	All	155 ft.	Standpipe	Steam piston	Hor. and vert.	None
Dennison & Uhrichs-ville	10,000	7,500	2,000,000	91 Creek	All	256 ft.	Reservoir	Electric d	Centrifugals	Rapid filtration
East Cleveland	20,000	20,000	2,010,000	100 Bought from Cleveland	.....	.....	.....	.....	.....	.....
Eaton	3,500	2,800	180,000	60 Wells and springs	All	175 ft.	Standpipe	Steam piston	Hor., air lift	None
Gibsonburg	1,886	1,400	57,000	75 Wells	All	110 ft.	Standpipe	Gasoline and crude oil	Air lift, triplex well	None
Gloucester	3,250	1,600	60,000	.. Wells	All	88 lbs.	Reservoir	Steam piston u	Direct acting.	None
Granville	1,400	1,400	100,000	25 Wells	All	114 lbs.	Tank	Steam	Compound	None
Hicksville	3,000	2,500	350,000	50 Wells	All	40 and 100 lbs.	.....	Steam	Centr.	None
Huron	1,800	1,200	120,000	.. Lake	All	46 lbs.	Tank	Steam piston	Hor. duplex, centr.	Rapid filters
Kent	5,500	4,000	165,000	100 Wells	All	265 ft.	Standpipe	Steam	Corliss engine	.....
Leesburg	890	450	750,000	100 Wells	All	60 lbs.	Standpipe	Gasoline	Triplex power	.....
London	4,500	4,300	750,000	20 Wells	All	50 lbs.	Standpipe	Steam	Direct acting	.....
McConnellsville	1,800	1,600	135,000	33 Wells	All	120 lbs.	Reservoir	Gas	Triplex power	None
Marietta	15,000	.....	2,200,000	25 River	All	.....	Reservoir	Steam	Direct acting.	Rapid filter
Marion	30,000	16,000	1,934,000	65 Wells	All	80 lbs.	Standpipe	Steam	Hor. comp.	Aeration
Massillon	16,000	15,500	900,000	44.5 Wells and impounding reservoir	.....	100 lbs.	Standpipe	Steam piston	Power	None
Maumee	2,750	750	27,500	100 Deep wells	All	200 ft.	Reservoir	Electric	Deep well, centr.	Aerated
Medina	3,600	2,700	300,000	100 River	All	135 lbs.	Standpipe	Gas	Triplex power	Rapid sand
Mt. Vernon	2,000	1,400	140,000	.. Wells	All	200 ft.	Standpipe	Steam piston	Recip. direct	None
North Baltimore	3,000	.....	1,000,000	45 Wells	All	43 lbs.	Reservoir	Steam piston	Recip. acting	Sedimentation
Norwood	25,000	25,000	1,700,000	100 Wells	All	100 lbs.	Standpipe	Steam piston	Cross comp., air lift	.....
Orville	4,000	.....	750,000	.. Wells	All	80	.....	Steam	Hor. duplex	.....
Oxford	2,000	.....	.....	.. Shallow well	All	150 ft.	Direct	Steam piston	Hor. comp.	.....
Painesville	7,000	6,000	1,500,000	86 Lake	All	90 lbs.	Standpipe	Steam piston	Hor. direct acting	Alum and chlorine
Piqua	15,000	12,000	.....	..... Canal	.....	.....	.....	Hydraulic,	.....	None
Ravenna	6,000	.....	1,200,000	25 Lakes	All	175 ft.	Direct	Steam turbine	Vert. Corliss, centr.	Rapid filter
Reading	4,500	2,700	106,641	85 Wells	All	196 ft.	Reservoir	Electric and steam	Air lift, hor. duplex	None

Sandusky	25,000	22,500	4,400,000	100 Lake	None	113 ft.	Standpipe	Steam piston	Recip. hor.	Alum and chlorine
Sidney	8,000	55,000	850,000	100 Wells	All	65 ft.	Standpipe	Steam	Vertical	None
Springfield	60,000	422,366	422,366	30 Wells	All	220 ft.	Standpipe	Steam	Duplex comp.	None
St. Mary's	5,750	1,200	450,000	45 Wells	All	100 ft.	Direct	Steam & hydraulic	Deep well, vert. & hor.	Rapid filter
Tiffin	14,000	11,500	555,773	90 Wells & river	All	55 lbs.	Direct	Steam piston	Hor. direct	Coagulation
Toledo	222,984	200,000	21,196,657	87.3 River	All	170 ft.	Direct	Natural gas	Triplex power	None
Toronto	4,500	4,500	1,200,000	50 Wells	All	140 lbs.	Reservoir	Steam piston	Hor. Direct	None
Troy	7,000	6,000	992,300	37 Wells	All	60 & 110 lbs.	.....	Steam piston	flywheel	None
Urbana	9,000	.....	1,000,000	Wells	All	6 lbs.	Reservoir	Steam piston	Hor. direct	None
Wadsworth	4,500	4,000	500,000	Wells	All	30 lbs.	Standpipe	Steam piston	Deep well	None
Wauseon	3,000	.....	250,000	Wells	All	55 lbs.	Standpipe	Steam piston	Air lift, duplex hor.	None
Wapakoneta	6,000	4,000	300,000	99.9 Wells	All	220 ft.	Direct	Electric	Duplex, hor.	None
Westerville	3,500	2,600	136,000	100 Wells	All	243 ft.	.....	Electric	Centr.	None
Xenia	10,000	10,000	835,450	25 Spring & Wells	All	.....	.....	Steam	Hor. recp.	Hypochlorite
Oklahoma:										
Altus	6,500	2,500	350,000	.. Impounding reservoir	All	.....	Standpipe	Gas	Triplex Power	Rapid Filter
Bartlesville	12,000	11,500	900,000	50 River	All	280 ft.	Standpipe	Steam & electric	Centr. Direct & Centr.	Filtration
Durant	12,000	10,000	500,000	50 River	All	450 ft.	Standpipe	Steam piston	Vert. direct	Rapid Filter
Hugo	8,000	8,000	500,000	80 River	All	290 ft.	Standpipe	Steam piston	Horizontal	Sedimentation
McAlester	15,000	14,000	800,000	90 Impounding reservoir	All	50 ft.	Standpipe	Steam piston	Duplex	None
Mangum	5,000	3,200	235,000	50 Wells	All	130 lbs.	Reservoir	Steam	Hor. cross comp. fly-wheel	None
Muskogee	35,000	35,000	3,500,000	95 River	All	150 ft.	Tank	Steam piston	For. recp., centr.	Rapid filter
Perry	3,500	.....	85,000	75 Impounding reservoir	All	70 lbs.	Standpipe	Steam	Hor. comp.	None
Oregon:										
Albany	.....	.....	.....	.... Canal	All	45-105 lbs.	Direct	Electric & hydraulic	Hor. duplex, vert. triplex	.....
Corvallis	6,235	.....	717,000	100 Mt. streams	None	225 ft.	Reservoir	Electric	Centr.	None
Grant Pass	5,000	3,600	460,800	95 River	All	225 ft.	Reservoir	Electric	3 stage centr. triplex power	Chlorine
Hood River	2,500	2,500	625,000	18 Spring	None	.....	Reservoirs	Electric	.....	None
Klamath Falls	5,000	4,800	1,000,000	Wells	All	.....	.....	.....	.....	None
La Grande	6,000	5,000	1,000,000	95 Mt. stream	None	210 ft.	Reservoir	Electric	Centr.	None
Marshallfield & N. Bend	8,000	.....	700,000	5 Creek	All	175 to 585	.....	Hydraulic & electric	Vert. & hor. recp.	None
Medford	10,000	9,500	2,500,000	Lake	None	.....	.....	.....	.....	Liquid chlorine
Portland	280,000	262,965	21,745,000	37.4 River	3	.....	.....	.....	.....	Rapid filter
Pennsylvania:										
Ashland	7,000	7,000	750,000	15 2 reservoirs	None	265 ft.	Reservoir	Electric	Deep well, power	Liquid chlorine
Barnesboro	3,500	1,500	175,000	10 Wells	All	.....	.....	.....	.....	Rapid filter
Bridgeport	4,000	3,800	120,000	50 Purchased	None	.....	.....	.....	.....	Liquid chlorine
Carbondale	22,500	22,500	5,500,000	Wells, impg. res. & lakes	.....	.....	.....	.....	.....	None
Catasauqua	5,000	4,500	600,000	50 Wells	All	75 lbs.	Standpipe	Steam	.....	None
Chambersburg	14,000	14,000	2,000,000	50 Mt. stream	None	175 lbs.	Standpipe	Steam piston	Hor. cross comp. fly-wheel, air lift	None
Duquesne	20,000	.....	600,000	100 Wells	All	.....	.....	.....	.....	.....
Easton	30,000	.....	3,434,493	.. River	All	250 ft.	Reservoir	Steam piston, steam turbine, inter-combustion, electric	Vert. & hor. recp., power & centr.	Hypochlorite
Elizabethtown	3,200	2,600	130,000	83 Wells & springs	All	95 lbs.	Reservoir	Gasoline & electric	Triplex power	None
Emporium	5,000	5,000	625,000	Reservoirs	In droughts	115 ft.	Reservoir	Steam piston	Direct acting	None
Ford City	6,000	12,000	400,000	2 Wells	All	85 lbs.	Standpipe	Electric & gas	Triplex power	Hypochlorite
Franklin	10,000	4,500	1,700,000	30 Wells	All	100 lbs.	Reservoir	Steam piston	Hor.	Hypochlorite
Gettysburg	4,500	4,500	400,000	96 Mt. creek	25-100	130 ft.	Reservoir	Steam piston	Comp. duplex	Rapid filter
Greensburg	50,000	45,000	2,500,000	96 Mt. stream	80	30-75 lbs.	Reservoir	Steam and electric	Hor. direct and centr.	None
Hanover	.....	13,000	1,500,000	35 Springs, streams & wells	None	286 ft.	Reservoir	.....	Recip.	Hypochlorite
Hollidaysburg	5,000	.....	2,000,000	None	None	.....	.....	.....	.....	Hypochlorite & copper sulphate
Indiana	7,000	5,000	400,000	75 Creek	All	240 lbs.	Reservoir	Steam piston	Comp. duplex	Rapid sand
Jersey Shore	7,000	7,000	1,500,000	.. Mt. streams	None	.....	.....	.....	.....	Rapid filter

For footnotes, see page 624.

TABLE NO. 1—GENERAL—Continued.

City	Population	No. supplied with water	Average consumption per cent metered	Source of Supply	Per Cent of Total Supply Pumped	Head	Pumped to	Kind of Power Used	Kind of Pump	Purification Process
Pennsylvania (Cont.):										
Junata	7,000	7,000	400,000	Mt. stream	None	445 ft.	Standpipe	Gas	Vert. triplex, air lift	None
Kane	7,500	7,500	750,000	70 Springs & wells	All	235 ft.	Res. & Standpipe	Steam & electric	Hor. centr.	None
Lancaster	57,000	61,000	7,120,000	50 Creek	All	125 lbs.	Reservoir	Steam piston	Recip.	Rapid filter
Lebanon	22,000	.....	2,500,000	32	25	.....	.....	.....	.....	Hypochlorite
Lehighton	5,600	5,000	1,750,000	20 Mt. streams	None	.....	.....	.....	.....	None
Lewistown	20,000	18,000	3,000,000	50 Creeks	None	271 ft.	Standpipe	Steam piston	Comp. duplex	Rapid filter
McDonald	7,800	7,500	500,000	99 Impg. reser-voir	All	300 ft.	Reservoir	Steam piston	Triple hor. direct	None
Meadville	12,780	15,000	2,200,000	100 Wells	All	140 lbs.	Res. & standpipe	Steam & hydraulic	.....	Sedimentation & liquid chlorine
Media	3,700	5,500	472,283	6 Creek	All	200 ft.	Reservoir	Steam piston	Hor.	None
Meyersdale	3,800	3,500	175,000	.. Wells & Impg. reservoir	In droughts	130 lbs.	Direct	.....	Vert. cross comp. & triple expansion	None
Minersville	9,000	9,000	1,000,000	40 Mt. streams	None	.....	.....	.....	.....	Rapid filter
New Kensington	22,000	22,000	2,500,000	.. River	All	95 lbs.	Reservoir	Steam piston & steam turbine	Triple direct, turbine	Rapid filter
Norristown	31,240	31,240	2,500,000	0.5 River	All	300,460,550 ft.	Res. & 2 tanks	Steam piston	Vert. direct acting	None
Oil City	20,000	20,000	2,500,000	W Wells & springs	Most	228 ft.	Reservoir	Steam piston	Triple vert. flywheel comp. duplex hor. high & low duty	Slow filtration
Reading	106,780	106,780	13,396,854	37.6 Springs Mt. streams & creek	56.9	.....	.....	.....	.....	None
Shamokin	40,000	40,000	5,166,000	.. Mt. streams & None	.....	.....	.....	.....	.....	None
Steelton	15,000	16,000	1,600,000	99 River	All	80 & 100 lbs.	Direct	Steam piston	Recip. & centr.	Slow filtration
Titusville	9,500	.....	1,800,000	.. Wells	All	.....	Reservoir	Gasoline	Deep well	None
Towanda	5,000	5,000	275,000	.. Springs & wells	In droughts	.....	.....	.....	.....	Liquid chlorine
Wellsboro	3,000	2,500	275,000	.. Springs & Mt. streams	All	600 ft.	Reservoirs	Steam piston	Duplex vert. cross comp.	Rapid filter, hypochlorite
Wilkinsburg ec..	110,000	100,000	10,000,000	99 River	All	232 ft.	Reservoirs	Steam piston	Vert. recp.	Slow filters
Rhode Island:										
Providence	284,400	284,400	18,025,276	.. Wells	All	218 ft.	Standpipe	.....	Hor. comp. duplex direct	None
Westerly	13,500	11,000	711,500	.. Wells	All	.....	.....	.....	.....	None
Wickford	4,000	4,400	2,040,409	83.8 Brook	All	162 ft.	Standpipe	Electric	.....	Rapid filter
South Carolina:										
Abbeville	5,785	3,000	350,000	98 Impg. reser-voir	All	125 lbs.	Standpipe	Electric	Centrifugal	Rapid filter
Anderson	12,000	.....	600,000	100 River	All	45 lbs.	Standpipe	Electric	Centr. & hor.	None
Beaufort	3,000	1,000	40,000	10 Wells	All	100 lbs.	Reservoir & Standpipe	Steam piston	Simple & comp. duplex	None
Bennettsville	4,000	.....	200,000	.. Wells	All twice	280 ft.	Direct	Steam piston	Cross comp. fly-wheel	Filtration
Charleston	59,000	.....	.....	.. Impg. reser-voir	All	80 ft.	.....	Electric	Centr.	Rapid filter
Cheraw	3,000	1,000	50,000	100 River	All	120 ft.	Standpipe	Steam & electric	Air lift, centr.	None
Clinton	3,800	.....	250,000	99 Wells	All	335 ft.	Res. & standpipe	Steam	Air lift & re-cip.	None
Florence	10,000	6,500	550,000	80 Wells	All	125 lbs.	Reservoir	Steam piston	Compound Centr.	Filter
Georgetown	5,530	.....	185,000	50 River	All	145 lbs.	.....	.....	.....	Filter
Union	7,500	.....	400,000	100 River	All	200 ft.	Standpipe	Gasoline and electric	Vertical	None
South Dakota:										
Aberdeen	15,000	10,000	1,000,000	65 Wells	None	150 ft.	Standpipe	Steam piston	Duplex comp. direct hor.	None
Brookings	4,000	2,400	100,000	100 Wells	All	.....	.....	.....	.....	None
Rapid City	5,000	5,000	900,000	.. Mt. spring	None	.....	.....	.....	.....	None
Watertown	9,000	6,000	.....	100 Wells	All	80 lbs.	Reservoir	Electric & Steam piston	Vert. & hor. direct, centr.	None
Tennessee:										
Cleveland	10,000	7,500	600,000	.. Spring & Wells	All	185 ft.	Standpipe	.....	.....	Aeration & sedimentation
Dyersburg	6,000	4,000	.....	.....	All	.....	.....	.....	.....	.....
Fayetteville	4,000	3,750	240,000	10 Springs	None	.....	.....	.....	.....	.....

Franklin	3,500	.....	.....	100 Springs	None	.....	Reservoir and tank	.....	.....	None
Greenville	5,000	3,500	250,000	12.5 Spring	All	110 lbs.	Standpipe	Electric	.....	Hypochlorite
Humboldt	4,500	3,500	310,000	30 Deep wells	All	150 ft.	Direct	Electric	Centr. hor.	None
Jackson	20,000	20,000	2,000,000	12 Wells	All	70 lbs.	.....	Steam piston	Triplex hor.	None
La Follette	3,000	.....	300,000	10 Reservoir	All	20 lbs.	Direct	Steam	Vert. flywheel	.....
Tulahoma	4,000	2,250	80,000	.. Deep wells	All	5 lbs.	.....	Electric	Triplex power	None
Union City	5,000	.....	250,000	.. Deep wells	All	40 ft.	Reservoir	Steam piston	Hor. flywheel	None
Texas										
Austin	40,000	40,000	3,700,000	100 River	All	350 ft.	Reservoir	Steam & elec-	Hor. recip.	Filtration.
Brownsville	20,000	20,000	700,000	100 River	All	150 ft.	Direct	Steam & elec-	centr. recip.	Filtration.
Dublin	3,500	.....	50,000	90 Deep wells	All	.....	Reservoir and standpipe	Steam	Deep well	None
Ennis	7,000	3,200	275,000	25 Wells	All	100 ft.	Standpipe	Electric	Centr. air lift	None
Galveston	40,000	40,000	3,231,264	75 Wells	All	60 lbs.	Standpipe	Electric	Air lift	None
Longview	7,000	2,250	175,000	72 River	All twice	377 ft.	Standpipe & tank	Electric	Triplex & centr.	Rapid filtra-
Mt. Pleasant	5,000	2,000	100,000	100 Lake well & lake	All	70 ft.	Standpipe	Electric	.....	None
Nacogdoches	7,500	4,500	225,000	60 Deep well	All	120 ft.	Reservoir	Steam & elec-	Centr. air lift	.....
Plainview	5,000	2,000	100,000	98 Wells	All	80 ft.	.....	Steam & elec-	Centr. comp.	None
Quanah	4,000	3,000	50,000	98 Wells	All	65 lbs.	Standpipe	Gasoline	Triplex power	None
Sweetwater	7,000	4,500	600,000	98 Impg. reser-	10	86 lbs.	Standpipe	Electric	Centr.	None
Stamford	5,000	4,500	.....	75 Impg. reser-	All	120 lbs.	Standpipe	Steam	Comp. duplex	None
Vernon	5,200	.....	160,000	40 Wells	All	42 lbs.	Standpipe	Steam & inter. comb.	Hor. recip.	None
Utah										
Lehi	3,500	2,000	300,000	None Spring	None	.....	.....	.....	.....	None Liquid chlorine
Salt Lake City	120,000	115,615	24,080,000	28.8 Mt. streams	None	.....	.....	.....	.....	.....
Vermont										
Barre	12,200	8,500	.....	.. Impg. reser-	None	.....	.....	.....	.....	.....
Burlington	22,000	21,800	1,072,143	95 Lake	All	289 ft.	Reservoir	Steam turbine & electric	.....	Rapid filtration
Essex Junction	1,400	.....	.....	50 Springs	Part	60 ft.	Reservoir	Electric	Triplex power	None
Fair Haven	3,000	2,700	.....	Pond	None	.....	.....	.....	.....	None
Northfield	1,800	1,400	70,000	80 Impg. reservoir	None	.....	.....	.....	.....	None
Richford	2,000	2,000	100,000	1 Reservoir	None	.....	.....	.....	.....	None
St. Albans	6,800	6,800	300,000	98 Reservoir	None	.....	.....	.....	.....	Hypochlorite
Virginia										
Charlottesville	12,000	10,000	1,200,000	65 2 reservoirs	None	230 ft.	Reservoir	Steam	Hor. cross comp. fly-wheel	None Alum
Danville	20,000	14,000	1,316,705	100 River	All	.....	.....	.....	.....	.....
Marion	3,250	3,000	500,000	None Spring	None	.....	.....	.....	.....	.....
Marionville	4,500	2,000	150,000	75 Creek	All	400 ft.	Standpipe	Electric	4-stage centr.	Chlorine
Radford	6,500	6,500	500,000	80 River	All	276 ft.	Reservoir	.....	2 stage centr.	Rapid filter
Richmond	155,900	145,000	13,400,000	.....	All	155 ft.	.....	.....	Recip. & centr.	Coagulation
Washington										
Bethesda	3,000	2,800	600,000	15 Springs	None	.....	.....	.....	.....	None
Bellingham	30,000	20,000	.....	25 Lake	None	.....	.....	.....	.....	None
Blaine	3,000	2,350	300,000	70 Deep wells	None	.....	.....	.....	.....	None
Centerville	10,000	7,000	2,000,000	05 River	None	.....	.....	.....	.....	None
Cheney	4,800	4,800	1,900,000	17 River	None	.....	Reservoir	Electric	Deep well	None
Cheney	1,600	1,200	96,000	None Wells	All	540 ft.	.....	.....	.....	None
Ellensburg	1,200	1,200	.....	None Springs	None	172 ft.	Reservoirs	Electric d.	Centr.	None
Ellensburg	5,000	3,370	3,000,000	11 Wells	All	.....	.....	.....	.....	None
Goldbar	600	600	.....	50 Mt. streams	None	250 ft.	Reservoir	Steam piston	Direct acting comp.	None
Hoquiam	13,000	13,000	2,250,000	.....	All	.....	.....	.....	.....	None
Montesano	3,500	2,000	.....	57 Mt. stream	None	217 ft.	Reservoir	Electric	Centr.	None
Olympia	9,000	7,500	750,000	100 Wells	All	200 ft.	Reservoir	Electric	Vert. plunger	None
Palouse	1,600	1,500	.....	None Impg. reservoir	None	.....	.....	.....	.....	None
Port Townsend	4,000	3,000	350,000	15 Mt. stream	None	.....	.....	.....	.....	None
Pullman	4,000	4,000	190,000	99 Well	All	235 ft.	Reservoir	Internal com-bustion	Centrifugal	None
Seattle	348,000	330,000	30,000,000	98 River	14	150 to 250 ft.	Standpipes	Electric & hy-	Triplex power, centr. recip.	Chlorine s
Snohomish	8,000	1,000	150,000	.. River	8	85 lbs.	Direct	Electric	Triplex power	None
Tolt	700	700	.....	.. Impounding reservoir	None	.....	.....	.....	.....	None
Walla Walla	20,000	.....	5,000,000	.. Mt. stream	None	125 ft.	Reservoir	Electric	Triplex power	None
Winlock	1,200	.....	75,000	40 Well	90	.....	.....	.....	.....	.....

For footnotes see page C24.

TABLE NO. 1—GENERAL—Concluded

City	Population	No. supplied with water	Average consumption	Per cent metered	Source of Supply	Per Cent of Total Supply Pumped	Head	Pumped to	Kind of Power Used	Kind of Pump	Purification Process
West Virginia:											
Fairmont	18,334	16,540	3,250,000	15	River	All	485 ft.	Reservoir	Steam piston	Hor. triple expansion recip.	Liquid chlorine
Martinsburg	13,000	12,500	1,375,000	25	Springs	All	40	.....	Steam piston	Hor. direct recip.	Hypochlorite
Piedmont	2,800	.....	.....	None	River	s	70 ft.	Reservoir	.....	.....	Chlorine
Princeton	6,500	4,000	165,000	30	Wells	All	235 ft.	.....	Steam piston	Air lift, hor. recip.	None
Sistersville	5,000	5,000	1,000,000	20	River	All	140 lbs.	Reservoir	Inter combustion	Triplex power	Rapid filter
Wisconsin:											
Baraboo	7,000	.....	.....	70	Springs	All	250 ft.	Standpipe	Steam, electric, hydraulic	Recip. & centr.	None
Beaver Dam	8,000	1,500	700,000	.....	Wells	All	140 lbs.	Standpipe	Steam piston	Hor. direct	None
Columbus	2,800	2,350	109,209	99	Wells	All	65 lbs.	Standpipe	Steam piston & electric	Hor. direct centr.	None
Eau Claire	19,000	17,500	.....	..	Wells	All	70 & 120	Direct	Steam, electric & hydraulic	Triplex power	None
Fond du Lac	22,000	20,000	1,269,125	.....	Wells	All	18 ft.	Reservoir	Steam piston	Air lift, recip.	None
Green Bay	30,000	25,000	922,559	100	Wells	All	176 ft.	Reservoir	Steam piston	Hor. deep well	None
Janesville	15,000	.....	1,100,000	37	Deep wells	All	.....	Standpipe	Steam piston	Direct duplex comp.	None
Kaukauna	5,000	3,100	200,000	50	Wells	All	65 lbs.	Standpipe	Electric d	Centr.	None
Kenosha	31,500	27,000	3,310,365	88	Lake & Wells	All	70 lbs.	Standpipe	Steam	High duty cross comp.	Rapid filters
Lake Geneva	3,500	.....	148,000	98	Deep well	All	186 ft.	Reservoir	Steam	Comp. duplex	None
Lancaster	2,500	.....	115,000	15	Springs	All	225 ft.	Standpipe	Steam	Recip.	None
Milwaukee	440,000	465,000	54,885,366	71.6	Lake	All	204 ft.	Standpipe & res.	Steam	Triple recip.	Liquid chlorine
New London	3,800	2,000	122,304	75	Wells	All	135 ft.	Standpipe	Electric	Centr.	.....
Oconomowoc	3,154	2,083	127,894	100	Wells	All	125 ft.	Standpipe	Steam & Electric	Hor. recip. centr.	.....
Oshkosh	38,000	.....	2,278,354	15	Lake	All	.....	Reservoir	Steam	Hor., comp., duplex	Hypochlorite & alum
Port Washington	4,000	.....	252,000	98	Lake	All	200 ft.	Standpipe	Steam	Centr.	None
Rhineland	6,500	5,900	1,100,000	6.4	River	All	132 ft.	Standpipe	Steam & Electric	Duplex, centr.	None
Richland Center	3,500	2,600	280,000	100	Lake	All	154 ft.	Reservoir	Electric	Triplex power centr.	None
South Milwaukee	7,000	5,000	900,000	.....	Well	All	250 ft.	Tank	Electric	Recip. & power	Rapid filters
Sparta	4,300	2,500	400,000	100	Wells	All	175 ft.	Standpipe	Steam	Cross comp.	None
Watertown	10,000	6,500	728,516	73	Wells	All	180 ft.	Standpipe	Steam	Hor. comp. duplex	None
Waukesha	11,000	.....	540,000	22	Lake	All	200 ft.	Standpipe	Electric	Centr.	None
Waupaca	2,980	2,400	.....	.....	Wells	All	184 ft.	Reservoir	Hydraulic and electric	Vert., centr., hor., recip. centr.	None
West Bend	3,000	2,500	130,000	95	Deep well	All	18 ft.	Reservoir	Electric	Triplex power centr.	None
Wyoming:											
Cheyenne	12,000	11,000	3,200,000	.....	Impounding reservoirs	None	.....	.....	.....	.....	Rapid filter, chlorine
Rock Spgs & Green River	7,000	7,000	1,620,000	38	River	All	200 & 346 ft.	Tanks	Steam	Comp. duplex	None
Sheridan	10,000	10,000	1,500,000x	..	River	None	.....	.....	.....	.....	None
Canada:											
Brantford, Ont.	27,000	25,500	2,983,000	25	Infiltration galleries	All	85 and 120 lbs.	Standpipe	Steam piston & steam turbine	.....	.....
Toronto, Ont.	527,556	95,000	50,310,000	..	Lake	All	65, 100 & 135 lbs.	.....	Steam piston, steam turbine & electric	Vert. direct, centr.	Filter & chlorine
Winnipeg, Man.	202,000	182,000	8,000,000	100	Wells	All	45 & 85 lbs.	.....	Electric d.	Recip. vert., centr., air lift	None

a—auxiliary supply pumped from 12 wells. b—4,000 in summer. c—fire pressure 300 feet. d—steam in reserve. e—all metered. 65% of water accounted for by service meters. f—24 feet for fires. g—all connections metered. h—creek used in extreme drought. j—2,400 in winter. 3,600 in summer. k—4.3% unmetered private fire supplies. l—includes water used by mines. m—lake water supply used for sewers, fire, etc. n—no meters. 40% used by railroad. o—also 75 feet to standpipe. p—all metered except sewer flush tanks and drinking fountains. q—auxiliary supply from wells pumped by direct acting steam pump to reservoir under 80 pounds head. Not used for three years past. r—52,000 permanent, about 150,000 in summer. s—for emergencies only. t—17,000 during college vacation. u—changing to electric and centrifugal pump. v—all metered except power house. w—all metered except flushing sewers, fires and cleaning streets. x—4,000,000 during summer months. y—all metered except that used by city. z—includes also Gutterberg, Hoboken, North Bergen, Secaucus, Town of Union, Weehawken, West Hoboken, West New York, Bergenfield, Bogota, Carlstadt, Cliffside Park, Gloucester, Cresskill, Delmont, Dumont, East Rutherford, Edgewater, Emerson, Englewood, Englewood Cliffs, Fairview, Fort Lee, Harrington Park, Hasbrouck Heights, Hawthorn, Hillsdale, Leonia, Little Ferry, Lodi Borough, Maywood, Moonachie, Norwood, Palisades Park, Passaic, Penn Manor and Youngwood. cc—includes also Edgewood, Swansale, North Braddock, East Pittsburgh, Turtle Creek, Chalfont, Wilmerding, Pitcairn, parts of Pittsburgh and the townships of Penn, Wilkins, Braddock, North Versailles, Patton and Rankin. dd—one consumer uses 100,000 gallons.

TABLE NO. 2.—DISTRIBUTION SYSTEM.

Ownership	Conduit to city			Length of street mains in service—cast iron unless otherwise indicated. w. l. = wrought iron; wd. = wood; st. = steel							
	Length	Size	Material	3" and under	4"	6"	8"	10"	12"	14" or larger	
Alabama:											
Anniston	P	40,440	16-20	c. l.	.....	31,400	29,600	7,900	4,400	20,000	6,300 ¹
Gadsden	M	3,000	14	c. l.	.....	1,500	110,000	10,200	34,000	.....	.....
Jacksonville	M	2 ml.	5	wood	25,900	5,000	5,100 ¹	.....	.....	.....	.....
Marion	M	.....	.....	.....	32.7 ²	80,707	436,060	55,813	14,925	20,529	92,537
Mobile	M	66,959	24-30	c. l.	4,812 w. l.	24,561	76,897	9,595	2,422	.....	.....
Selma	M	.....	.....	.....	4 m. w. l.	5	6	3	.....	1,000	.....
Talladega	M	3.5 ml.	12	c. l.	.....	9 ml.	4, 6 & 8-inch	.....	.....	.....	.....
Troy	M	.....	.....	.....	.....	1/2 mi.	1/2 ml.	1 ml.	.....	.....	.....
Tuskegee	M	.....	.....	Reservoir in city	.....	no data	.....	.....	.....	.....	.....
Union Springs	M	.....	.....	Reservoir in city	.....	.....	.....	.....	.....	.....	.....
Arkansas:											
Hot Springs	P	.....	10-12	c. l.	.....	.....	.....	.....	.....	.....	.....
Mena	M	3,960	6	steel	.....	.....	.....	.....	.....	.....	.....
Pine Bluff	P	.....	.....	.....	4.2	20.9	5.5	2.0	2.9	1.7	.....
California:											
Glendale	M	2,600	16	steel	.....	12,550 w. l.	6,500 w. l.	.....	.....	3,600 st.	6,700
.....	M	7,000	20	c. l.	30,100 w. l.	75,800 st.	24,250 st.	.....	.....	.....	.....
Grass Valley	M	.....	12-22	c. l.	.....	12,800	6,500	.....	.....	.....	.....
Lodi	M	.....	.....	.....	about 16 miles	.....	.....	.....	.....	.....	.....
Monrovia	M	5 1/2	14-22	steel	20,000 ml.	4,000	20,000	4,000	3,000	.....	.....
.....	M	.....	.....	& con	90,260 w. l.	48,640 st.	10,140 st.	.....	.....	.....	.....
.....	M	.....	.....	.....	21,440	11,300	7,260	920	.....	.....	.....
Palo Alto	M	.....	.....	wells within city	6,130 w. l.	66,981	31,003	9,318	4,917	2,110 st.	.....
Oxnard	M	.....	.....	.....	910 ³	42,341	1,203	10,326	557	470	600
Pacific Grove	P	.....	12	c. l.	392,012 wd. & c. l.	under 6 inches	47,385 c. l. & w. l.	6-12-in.	.....	230,104	.....
.....	M	.....	.....	.....	5,000 st.	3,000 st.	2,000 st.	.....	.....	.....	.....
Santa Cruz	M	2.5	14	.....	200,000 w. l.	40,000	30,000	20,000	1,000 st.	10,000	208
Pomona	P	5,280	10-14	steel	about 100 miles, 2 to 14-in., iron & st.	.....	.....	.....	.....	.....	.....
Riverside	M	9 ml.	30	stl. wd.	.....	.....	.....	.....	.....	.....	.....
San Diego	M	22 ml.	24-40	& con.	693,106 w. l.	340,968	261,304	72,24	91,699	155,879	122,794
.....	M	1 1/2	12	.....	5	6	10	4	6	5	.....
Santa Rosa	P	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sierra Marde	M	5,380	16	steel	.....	3,000 w. l.	58,100 st.	10,560 st.	5,400 st.	.....	.....
So. Pasadena	P	.....	.....	.....	.....	90,000	60,000	28,000	8,500	14,000	7,768
Stockton	P	.....	.....	.....	.....	.....	4,800	1,550	2,650	2,600	3,600
Whittier	M	11,300	16-18	steel	48,000 w. l.	73,900 wd.	12,200 wd.	1,600 wd.	1,800 wd.	.....	.....
Colorado:											
Colorado Spgs.	M	114,477	10-24	c. l. & stl	102,379 ³	.....	.....	.....	.....	.....	.....
.....	M	.....	.....	.....	32,376 w. l.	181,846	170,966	38,227	31,680	60,086	33,580
Durango	M	1 ml.	10	c. l.	5,275	29,881 st.	16,278	8,331	.....	.....	.....
Grand Junction	M	20 ml.	14-22	st. & w.	18,300 w. l.	6,200 st.	28,500 st.	.....	.....	6,200 st.	.....
.....	M	.....	.....	.....	26,000	27,025	.....	5,100	.....	4,675	.....
Greeley	M	3 ml.	20	wd.	.....	56,925 st.	24,475 st.	14,600 wd.	1,004 st.	5,309	5,347
.....	M	.....	.....	.....	39,200	.....	.....	8,350	.....	.....	.....
Longmont	M	123,051	12-30	st., c. l.	11,780 w. l. & conc.	4,202	3,409	14,670	8,796 st.	933 w. l. ³	.....
.....	M	.....	.....	.....	.....	933 w. l.	10,502 w. l.	6,070 w. l.	.....	.....	.....
Montrose	M	64,425	8-12	st. & wd.	4,320 w. l.	40,135	32,432	11,060 st.	.....	.....	.....
Rocky Ford	M	4,600	8	c. l.	24,475 w. l.	28,100	10,105	3,020	1,600	1,990 st.	.....
Connecticut:											
Bristol	M	6,500	14-36	.....	36,434 w. l.	32,166	72,642	31,297	16,839	16,013	8,396
.....	M	6,500	12	.....	.....	.....	.....	.....	.....	.....	.....
Danbury	M	9 1/2	16-30	c. l. wd. & conc.	60 miles c. l. and conc., 4-inch to 20-inch	.....	.....	.....	.....	.....	.....
E. Hartford	M	7	10-16	.....	2 ml.	10	15	15	10	9	6
Hartford	M	57,172	20-30	c. l.	14,650	46,557	390,515	196,617	87,039	99,672	182,683
Litchfield	P	5	8	.....	.....	.....	.....	.....	.....	.....	.....
Naugatuck	P	10	10-20	c. l.	40 mi. total	.....	.....	.....	.....	.....	.....
New Britain	M	2 1/2	24	c. l.	.....	34,102	244,881	30,142	.....	34,771	27,954
Norwich	M	3	24	.....	.....	.....	.....	.....	.....	.....	.....
.....	M	3	16	.....	3,450 w. l.	66,732	136,967	12,422	33,199	11,151	.....
Portland	P	4	10	c. l.	.....	2	4	5	6	.....	.....
Putnam	M	2 1/2	10	.....	.....	.....	.....	.....	.....	.....	.....
Southington	M	27,739	10-12	c. l.	30,441 w. l.	22,327	60,071	21,365	15,645 ⁴	.....	.....
Suffield	P	1	8	c. l.	5	6	1	2	.....	.....	.....
Wallingford	M	4 1/2	8-16	.....	.....	.....	.....	.....	.....	.....	.....
.....	M	.....	12-18	.....	1 w. l.	25.5 ml. 4 to 12-inch c. l.	.....	.....	.....	.....	.....
Westport	M	.....	.....	.....	.....	35,806	24,816	27,736	5,628	.....	.....
Williamantic	M	3	12-14	c. l.	.....	.....	.....	.....	.....	.....	.....
Windsor	M	4,000	8	.....	.....	.....	.....	.....	.....	.....	.....
.....	M	9,400	10	c. l.	6,263	6,292	24,883	8,412	18,826	.....	.....
Winsted	M	10,960	16-24	.....	300	48,476	51,915	3,200	1,860	7,666	.....
Delaware:											
Millford	M	150	15	wd.	.....	1	2	4	2	.....	.....
District of Columbia:											
Washington	M	16	108	conduit & tunnel	91,740 ³	224,540	1,411,780	805,500	13,750	366,220	297,890
Florida:											
Daytona	M	2,000	10	c. l.	.....	2 1/2 w. l.	.....	5 1/2	21-6	.....	.....
Live Oak	M	.....	.....	.....	.....	17,004 w. l.	9,558	5,709	708	1,123	.....
Pensacola	M	.....	.....	.....	.....	.....	.....	29	4	.....	1
St. Augustine	M	6,200	10	.....	.....	6,100	.....	46,800	15,000	7,400	1,350
Georgia:											
Albany	M	.....	.....	Reservoir in city	about 13 miles, all sizes	.....	.....	.....	.....	.....	.....
Americus	M	.....	8-12	.....	.....	2 w. l.	53,141	21,933	6,690	9,380	4,150
Athens	M	.....	.....	.....	.....	.....	.....	65,509	32,535	4,580	11,576
Columbus	M	6,650	24	c. l.	.....	3 w. l.	25,270	123,203	32,870	3,462	38,000
Commerce	M	9,663	10	c. l.	20,187 w. l.	.....	.....	6,031	6,441	.....	20,377
Dublin	M	4,800	8-10	.....	.....	.....	.....	35,230	6,500	2,150	.....
Fort Valley	M	900	8	c. l.	2,000 w. l.	.....	.....	2,500	15,000	.....	.....
Hawkinsville	M	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Madison	M	10,260	6	c. l.	.....	.....	.....	.....	.....	.....	.....
Marion	M	.....	.....	.....	.....	1/2 w. l.	.....	.....	.....	.....	.....
Milledgeville	P	3,960	10	conc.	.....	.....	5 miles 4 to 10-inch cement	.....	.....	.....	.....
Quitman	M	.....	.....	.....	.....	5,000 w. l.	.....	8,800	12,000	.....	.....
Statesboro	M	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Thomasville	M	.....	.....	.....	.....	10,000 w. l.	30,000	25,000	5,000	.....	.....
Washington	M	10,560	8	c. l.	.....	.....	1	2 1/2	.....	.....	.....
Waynesboro	M	3,960	18	c. l.	.....	1 1/4 w. l.	.....	1 1/4	.....	.....	.....
Idaho:											
Lewiston	M	.....	.....	Reservoirs in city	.....	3,575 st.	58,373	27,130 st.	16,575 st.	7,000 st.	12,800 st.
.....	M	.....	.....	.....	.....	6,845 ³	669	13,638 wd.	8,720 wd.	8,810 wd.	6,000 st.
Sandpoint	P	4	8-14	wood	.....	1,601 wd.	73,677 wd.	20,033 wd.	9,373 wd.	4,820 wd.	.....

For footnotes see page 632.

TABLE NO. 2.—DISTRIBUTION SYSTEM—Continued.

Ownership	Conduit to city		Length of street mains in service—cast iron unless otherwise indicated. w. i. = wrought iron; wd. = wood; st. = steel							
	Length	Size	Material	3" and under	4"	6"	8"	10"	12"	14" or larger
Idaho (Continued):										
Twin Falls.....M	13,200		6	wood	22,000 w.i.	35,000 wd.	13,500 wd.	3,000 wd.	1,700 wd.	.....
Weiser.....M	.....					11,380	33,038	13,722	10,143	1,637
								1,500 wd.	2,800 wd.	.....
Illinois:										
Canion.....M	2,640		8			12	8	5 3/4		1/2
Chicago.....M	Intake from lake					2,757.72 miles, 4 to 48-inch				
Effingham.....P	.....					27,456	26,600	2,400	2,600	
Elgin.....M	132		24		45,363 w.i.	33,939	228,212	44,171	11,033	7,435
Farlington.....M	2,640		10	c. i.						23,837
Flora.....M	.....				3,000 w.i.	4,510	36,590	4,660		
Freeport.....P	.....				41,707 w.i.	78,108	135,436	27,801	7,276	2,150
Galesburg.....M	300		16-18	c. i.			29	8	6	3,646
Genoa.....M	Reservoir in city					4 3/4	4 3/4	4,300	800	1,000
Harvard.....M	.....					6 1/2	1 1/2	1		
Joliet.....M	.....		14-16	c. i.	1,050	33,500	150,640	44,060	13,470	14,510
Kewanee.....M	.....					1.4	20.	1.81	0.64	14,330
Macomb.....M	6,390		12	c. i.						
Mattoon.....M	4.75		18 & 12	c. i. & clay	2	0.2	1.0	0.5	0.5	0.5
							2,100 st			
Metropolis.....M	Reservoir in city					27,350	5,775	3,600	1,350	
Melrose Park.....M	.....					2	10	2		1
Mt. Carmel.....P	1,400		14			67,800	18,000	3,600	6,000	2,000
Mt. Olive.....M	10,890		10-12	c. i.		19,800	3,960			
Mt. Vernon.....P	2,220		12	c. i.	22,866 w. i.	52,378	16,070	2,352		7,872
Normal.....M	.....					10	12	1	2 1/2	2 1/2
Oak Park.....M	.....					24.35	34.48	11.04	5.98	2.20
Paris.....M	1 1/4		12	c. i.	400 w.i.	22,439	60,796	1,210		11,270
Quincy.....M	Reservoir in city				15,325 w.i.	3,816	295,789	40,307	15,539	8,451
Rochelle.....M	.....		8	c. i.		6	2	2		18,642
Rock Island.....M	5,280		16	c. i.						
Sandwich.....M	.....				3,680 w.i.	44,350	1,575	2,050	1,300*	8,000*
Springfield.....M	.....		15-24		2,040*	12.6	81.6	0.3	14.6	9
St. Charles.....M	.....					4 ml.	15 ml.	800	5,000	
Sterling.....P	.....					85,258	57,998	27,404	23,725	6,833
Streator.....P	3	14	c. i.	9 ml	45,626	95,388	14,600		2,940	9,400
Watseka.....M	.....	none			10	2	1			29,924
Waukegan.....M	.....	24								
Indiana:										
Attica.....M	1	12		1,000 st.	9	2	1.5	1	1	400
Auburn.....M	.....				39,458	12,200	7,900	3,400	600	
Batesville.....P	.....	6	c. i.		2	4	3,000			
Bedford.....M	1 1/2	12	c. i.		56,506	12,580	4,475	3,300		
Bluffton.....M	2,000	10	c. i.		8 3/4		1 1/2	1		
Brazil.....M	.....			4,018 w.i.	63,430	4,536	5,496			4,350
Clinton.....M	.....								
Crawfordsville.....P	.....	16	c. i.							
Delphi.....M	3	6	wood	3,225	23,763	3,474	2,022	2,430*		
Ellettsville.....P	.....				11,910	32,920	11,380	2,920	5,740	
Falmouth.....M	.....								
Gary.....P	3	72	concrete	65 ml.	2,000	2,000	10,000	1,000		1,500
Gas City.....M	.....			26 ml., 4 to 16 ins., c. i. & wd.						
Goshen.....M	.....								
Greensburg.....M	1 1/2	12								
Kendallville.....M	.....				24,527	14,460	6,365	650		
Lafayette.....M	14,146	16-20	c. i.	7,098	31,559	146,139	19,922	28,830	4,689	15,133
La Porte.....M	5	18	c. i.		89,988	10,747	2,330	4,275	2,502	25,521
Lebanon.....M	.....								
Linton.....P	3	12	c. i.	19,486*	17,600	27,321	4,000	1,220		
Logansport.....M	.....				43 miles, various sizes					
Mishawaka.....M	.....				35,808	70,634	17,279	16,551	6,551	8,900
Montpelier.....P	.....				400 w. i.	6,000 w. i.				
					2,300	2,400	600	300		
New Castle.....M	.....				2,800 w. i.	75,000	21,400	5,600	6,000	4,000
					6,963 w. i.	169,881	23,374	11,137	1,041	648
Noblesville.....P	.....								
North Manchester.....M	.....								
Peru.....M	3,500	12	c. i.		730 w.i.	2,660	95,756	27,065	1,500	16,156
Plymouth.....M	.....									4,012
Portland.....M	.....					36,770	17,367	2,260		
Richmond.....P	25,931	20	c. i.	6,680		10	3	1 1/2		
Rockport.....P	5,000	8	c. i.	14,800 w.i.	7,800	10,700	6,600	188		14,101
Rushville.....M	.....					10	4	4	3	2
Seymour.....P	1,600	12	c. i.	16 miles all sizes						
South Bend.....M	.....				1,463 w.i.	33,837	458,146	34,084	81,706	61,536
Sullivan.....P	.....	9 ml.	12							18,734
					599 w.i.					
Terre Haute.....P	0.75	16	c. i.	1,698*	30,912	163,876	204,873	14,994	77,781	28,345
Union City.....M	.....				1,400 w.i.	17,291	40,921	5,887	4,050	1,724
Vincennes.....P	.....									600
W. Terre Haute.....M	.....				1,000 w.i.	0.5	0.7	0.8		
Iowa:										
Albia.....M	2	10	c. i.							
Ames.....M	.....					12	0.5	0.4		
Atlantic.....M	.....				5 w.i.					
Boone.....M	20,000	14	c. i.		0.7 w.i.	11.59	9.63	4.79		
Burlington.....P	.....				1,652*	42,827	140,697	64,271	20,258	8,251
Cedar Falls.....M	.....					22.68	miles, all sizes			4,340
Cedar Rapids.....M	.....					68	miles, 6-20-inch			
Charles City.....M	.....					78,067	1,699	17,133	875	
Cherokee.....M	.....				684 w.i.	3.42	7.76	0.83	0.72	
Council Bluffs.....M	3.5	1,624	c. i.	10,46 w.i.	22.61	21.13	5.29	0.8	2.12	4.06
Creston.....P	1					4	2	4		
Denison.....M	.....					15	2	2		
Duquoin.....M	30,200	16-24	c. i.			4.6	40.0	8.7	2.2	4.5
Fairfield.....M	.....	10	c. i.	1.5 w.i.		6	5.5	0.75		5.2
Glenwood.....M	.....	8	c. i.	6*		50*	25*			
Indianola.....M	.....					7	2	1		
Knoxville.....M	6.5	10	c. i.			20,168	29,000	4,271	2,093	
Maquoketa.....M	.....					1	11	0.25	0.75	
Mason City.....M	.....				1,006 w.i.	36,252	143,062	26,890	16,416	7,800
Mt. Pleasant.....M	.....				4,315 w.i.	32,618	8,088	10,680	2,048	
Muscatine.....M	1.5	16	c. i.			69,717	61,484	55,209	45,817	19,777
Osage.....M	.....				6 miles, different sizes					
Osceola.....M	1 1/4	8	c. i.				2	1		
Red Oak.....M	.....				22,134 w.i.	19,357	22,992	2,766	8,431	
Sioux City.....M	.....	24	c. i.		336,810 w.i.	33,535	338,781	80,115	15,413	61,067
Washington.....M	.....					9	4	1 1/2	1/2	38,639
Winterset.....M	2	8				7	1 1/2	2 1/2		

For footnotes see page 632.

TABLE NO. 2.—DISTRIBUTION SYSTEM—Continued.

Ownership	Conduit to city		Length of street mains in service—cast iron unless otherwise indicated. w. i. = wrought iron; wd. = wood; st. = steel							
	Length	Size	Material	3" and under	4"	6"	8"	10"	12"	14" or larger
Massachusetts (Cont.):										
Springfield.....M	39,040	42	steel							
Swampscott.....M					15,850 w. i.	1,088	76,753	6,593	18,306	6,714
Taunton.....M	7	30	c. i.			43,345	253,498	123,632	460	46,745
Turner's Falls.....M					981	5,764	28,433	14,088	2,487	11,927
Walpole.....M					1,650 w. i.		115,549	27,825	10,600	11,447
Waltham.....M	2,300	24			10,522	64,445	114,843	73,752	24,611	11,250
Weymouth.....M		18	c. i.		30,771 w. i.	19,454	197,922	39,507	34,625	19,087
Winchendon.....M					7,726 w. i.		64,181	20,613	21,174	10,039
Winthrop.....M					4,179	49,821	51,739	33,987	24,073	4,049
Worcester.....M	30	16-48			243,639	67,884	258,402	301,648	45,722	288,416
Michigan:										
Albion.....M						76,000	28,000	7,600		2,330
Allegan.....M						53,000	7,060	16,650		825
Alpena.....M	40-inch	intake from lake			7,354	2,080 ¹⁵	5,857	8,350		9,280
Battle Creek.....M	3.25	12, 16, 20	c. i.			15,000	228,800	92,000	1,800	40,000
Belding.....M	1,000	12	c. i.		300 w. i.	27,386	34,750	2,850	3,000	
Bessemer.....M	10-inch				0.1	0.2	4.5	1.3		
Big Rapids.....M						36,000	10,850	7,600		5,900
Coldwater.....M		16	c. i.		1,125	53,390	36,959	13,925	14,250	1,525
Charlotte.....M						51,381	23,760	5,952	2,640	7,920
Crystal Falls.....M	3,200	8	c. i.		800	13,000	22,883	8,800		
Dowagiac.....M					9,000 w. i.	31,000	39,500	675	1,900	
Eastville.....M						500	17,856	7,400		
Flint.....M						117,365	219,400	66,610		42,350
Grand Rapids.....M	2,700	48	concrete			40.02	101.81	27.74	15.09	25.77
Hastings.....M						18 miles	2-12 inches			
Highland Park.....M	56,350	30	c. i.			138,866	59,864	4,245	7,207	33,337
Holland.....M	3,495	12	c. i.		2,027 w. i.	34,848	107,595	14,823	7,263	2,233
Houghton.....M	3,000	6-10	c. i.		7,340 w. i.	17,435	31,720	19,170	11,290	
Ionia.....M					½ w. i.		1 w. i.	1	2	
Ishpeming.....M	5,280	14	wood		16,441 ¹⁵	28,363 ¹⁵	26,443 ¹⁵	5,897 ¹⁵	3,353 ¹⁵	3,510 ¹⁵
Jackson.....M	4,300	24	c. i.			36.5	52.5	2.6	5.6	1.1
Ludington.....M						4 miles of wood and 19 miles c. i.				
Manistee.....M					23,400 w. i.	28,005	57,230	24,020	4,475	5,070
Marine City.....M					1,500					920
Marquette.....M					1,120 w. i.	74,785	87,391	9,480	4,802	8,815
Mt. Clemens.....M					345 w. i.	54,360	67,425	6,735	7,624	4,812
Muskegon.....M					5,894	58,517	239,991	16,689	10,803	24,084
Norway.....M	5,000	12	c. i.			5,000	15,350	3,300	26,325	77,174
Onaway.....M	1,000	10	c. i.		600 w. i.	32,000 wd.		8,000 wd.		
Pawpaw.....M	1,700	10	c. i.			4½	¾	½		
Sturgis.....M					27,750 w. i.	54,000	8,625	1,300	2,075	
Traverse City.....M					Totals about 40 miles					
Yale.....M						3.5	0.5	0.75	2 ⁸	
Minnesota:										
Alexander.....M							19,000	1,225	300	
Bemidji.....M						52 ⁸	7,200	4,200	4,800	
Brainerd.....M						5 miles of 4 to 6 c. i., 12 miles 4 to 12 kal.				
Cloquet.....M	6,300	10	c. i.			4,147	47,746	4,210	12,134	1,660
Duluth.....M	46,090	36-42	st. & c. i.			9,945	557,800	44,372	25,131	82,598
Eveleth.....M	27,444	10-16				586 ¹⁵	1,150 ¹⁵	461 ¹⁵	2,866 ¹⁵	680 ¹⁵
Fairmont.....M						2,805	43,124	1,374		
Faribault.....M	0.5	12	c. i.			47,520	8,000	9,500	800	
Lake City.....M	6,480	12	c. i.			25,132	61,835	19,516	1,184	10,069
Melrose.....M	1,200					2,016	8,400	12,000	2,000	400
New Ulm.....M	5,898	10-14				8	6	4		
Northfield.....M					3,000 w. i.	6,015	44,047	3,355		
Owatonna.....M						23,208	18,205	5,420	2,072	5,958
Rochester.....M		10				3½	8	1½	1½	
St. Paul.....M	5	72	brick			40,000	50,000	5,000	2,000	11,000
St. Peter.....M						76,275	1,475,271	27,877		299,503
Staples.....M		10	c. i.			66,050	7,000			326,018
Stillwater.....M		8	c. i.			300	8,000	5,000	600	
Thief River Falls.....M						5,690	48,671	24,252	2,607	5,177
Two Harbors.....M						1,500	26,000	3,800	900	
Virginia.....M						21,620	6,010	1,880		3,590
Willmar.....M						14,562 w. i.	37,272	28,088	10,483	3,865
Mississippi:						2,000 w. i.	39,000	5,000	1,500	
Corinth.....M						6½ miles, 6-10-inch.				
Greenwood.....M	¾	8	c. i.			60,000	7,500	2,500	2,500	
Jackson.....M						36,000	50,000	48,000	128,000	64,000
Lexington.....M							6	¾	¾	27,850
Natchez.....M						32,500	79,430	14,400	3,600	1,700
Pascagoula.....P						3	2	½		400
Lupelo.....M	1,200	10					6			
Water Valley.....M	¾	8	c. i.			3	2	¾		
Missouri:										
Albany.....M						1	4	1		
Butler.....M	4	8	c. i.			10,430	4,100	3,950		
Carrollton.....P						15,054	3,000	4,500	2,800	2,600
Cartersville.....M										
(see Webb City)										
De Soto.....M						½ st.	1st.			
Farmington.....M						38,500	1,500	4,000		
Fulton.....M	4,000	8	c. i.			36,000	66,160	18,786	8,753	13,417
Hannibal.....M		14-20	c. i.			20,000	1,300	2,200		19,775
Macon.....M	½	6-8	c. i.			1,000 st.	800 st.	4,100 st.	8,000	
Mexico.....P	1½	10				19,000 st.	1	10	6	½
Rich Hill.....M						¾ w. i.			2	¾
St. Louis.....M	15	84-144	st. & masonry			15.7 ⁸	2.2	602.6	15.3 st.	9.5
Slaters.....M	6	12	c. i.				4	1	16.9 st.	177.8
Trenton.....M	12	12	c. i.			1,000 w. i.	19 miles 4-10-inch			172.8
Washington.....M						1,213 w. i.	7,449	19,415	2,481	
Webb City.....P						1,440 ⁸	67,310	52,718	17,453	1,110 ⁸
West Plains.....M	1	8					1½	2½	1	12
Montana:										
Anaconda.....P	27,370	8-24	w. i.			5,015 w. i.	29,982 w. i.	43,282 w. i.	18,645 w. i.	3,650 w. i.
Billings.....M							38,414	22,181	12,161	14,183
							749 ¹⁵	126 ¹⁵	4,658 ¹⁵	6,261
							24,794 wd.	58,200 wd.	10,355 wd.	6,776 wd.
										17,978 wd.

For footnotes see page 632.

TABLE NO. 2.—DISTRIBUTION SYSTEM—Continued.

Ownership	Conduit to city			Length of street mains in service—cast iron unless otherwise indicated. w. i. = wrought iron; wd. = wood; st. = steel							
	Length	Size	Material	3" and under	4"	6"	8"	10"	12"	14" or larger	
Montana (Cont.):											
Deer Lodge..... P	.....		12	wood	3,123	5,400	2,600				
Glendine..... M	4,400	8-10	c. i.			12,913 wd.	5,750 wd.	4,200 ^a	3,850 wd.	5,300 wd.	
Great Falls..... M	.....	12-16			2,158 w. i.	3,732	336	4,747	2,500		
Havre..... M	1,702	10	steel			11,730 wd.	25,767 wd.	28,176		14,522	
Kalispell..... M	5,340	12-18	wood			8,664	179,887	2,221 w. i.	6,123	14,720 w. i.	5,200
						6,383	30,160	5,313	758		
						2,264 st.	44,339 st.	1,830		2,904	142
							36,005 wd.	945 wd.	1,823 st.	2,509 st.	
							2,161 spiral			3,444 wd.	9,719 wd.
Libby..... P	.....	26	wood	500 st.		12,010 st.	6,270 st.	3,960 st.	2,140 st.		
Livingston..... P	1	8	c. i.			35,382	23,708	3,630	1,526	78	
Nebraska:											
Auburn..... M	.....					15,000	3,000	10,000			
Grand Island..... M	.....					6	20	2			5,980
Hastings..... M	.....				1925 w. i.	140,110	20,750	4,200	10,575		1,575
Norfolk..... M	1½	8-10	c. i.			11	2	1¾	¾		
North Platte..... M	.....				39,312 w. i.	5,248	30,394	4,600	1,500	1,335	
Schuyler..... M	.....					1¾	¾	¾	¾	¾	
						¾ wd.	¾ wd.	¾ wd.			
Nevada:											
Carson City..... P	2	10-12			52,000 w. i.	10,000 w. i.	2,000	2,100	6,000 st.	400 st.	
New Hampshire:											
Berlin..... P	.....				28,445 w. i.	2,883	32,809	3,695	7,891	4,400	
					c. i. & cement	8,211	34,136	14,494		2,216	
Claremont..... M	1½	12-20			19,914	10,535 ¹¹	13,010 ¹¹	7,609 ¹¹	2,030	8,237 ¹¹	7,454
						31,261	115,320	22,815	46,778	24,759	55,848
Concord..... M	2,962	20	c. i.			1,281 ¹¹	11,959 ¹¹	6,438 ¹¹	1,732 ¹¹	11,567 ¹¹	26,731 ¹¹
Dover..... M	2	16	c. i.								
Franklin..... M	.....	12	c. i.								
							24.3 miles 6 to 16-inch				
							62,651 ft. all sizes				
Keene..... M	.....				13,963 w. i.	54,266			1,785	28,500	2,261
Lebanon..... M	¾	10	c. i.		4,250 w. i.	21,859	16,670	5,467		6,437 ¹⁸	2,261
Manchester..... M	2½	30	c. i., c. i.			22,160	432,733	132,544			
Milford..... M	.....					6¾ miles 4 to 10-inch					
Newport..... M	5	6-10				5,009	62,963	3,348	4,825	1,255	
Rochester..... M	9	12-16	c. i.								
New Jersey:											
Atlantic City..... M	.....	48	c. i. & wd.			180,520	128,491	76,904	11,904	56,477	21,623
Branchville..... M	4.9	8	wood			4	1				
Bridgeton..... M	.....				400	30,273	116,463	13,127	1,225	2,712	16,470
Burlington..... M	125	16	c. i.			10,000	39,000	11,000	6,000	3,000	1,730
Camden..... M	6¾	36	c. i.			119	½ miles, 3 to 36 inches.				
Chatham..... M	.....				400	5,400	5,000	4,200	6,500		
Dover..... M	.....	10	c. i.			2	8	6	7		
East Orange..... M	19,465	24	c. i.			113,509	210,474	59,473		75,399	13,073
Freehold..... M	.....				1,896 ^a	30,076	11,278	2,701	8,118		
Gloucester..... M	.....	20	c. i.			12	2	1½			2½
Irvington..... P	2	12	c. i.		11,400 w. i.	43,600	139,800	23,900			
						14,000 ¹⁰					
Jamesburg..... P	10,000		c. i. & cem.			2,500	2,800 ¹⁰	800 ¹⁰			
Lambertville..... P	6,000	8	c. i.		500	12,575	9,500				
Jersey City..... M	22.9	72	steel		1,488 ^a	1,787	116,616	47,520	6,558	17,400	46,918
Milltown..... M	1½	10	c. i.			2,930	18,000	1,639			
Montclair..... P	5	20	c. i.			9.95	52.08	12.98		6.63	6.26
Netcong..... M											
Newton..... M	9	10	c. i.			2	3	5			
Nutley..... P	.....					52,800	95,000	4,700			
								31,807			
Pleasantville..... P	8	10-12	c. i. & wd		60,079	47,584	33,130	3,700 wd.	7,800	8,100 wd.	
Rahway..... M	.....				15,458 w. i.	22,240	59,423	8,889	9,554	14,284	
Ridgewood..... P	.....				488 w. i.	31,948	178,604	23,900	3,359	17,063	
Wallington..... M	.....				500	14,950	16,100	6,200	4,275 ^a		
Washington..... P	11,200	10	c. i.			36,288	12,755	4,215	3,810		
West Orange..... P	.....				8,065 w. i.	29,033	149,272	22,598			
New Mexico:											
Las Vegas..... P	7	8-16	c. i.		7,300 w. i.	28,300	5,200	2¾	15,300 ^a		
Raton..... M	10.5	12-15	vit. & steel			20 miles 4-12-inch.					
New York:											
Albany..... M	7,925	48	concrete		1,004 ^a	64,892	308,527	177,543	16,017	161,843	111,169
Amityville..... P	.....					16,870	35,166	8,241			
Amsterdam..... M	14	24-30	c. i.			50.9	miles, all sizes				
Auburn..... M	3,725	24				24,013	235,747	27,009	9,541	57,913	3,149
Beacon..... M	2¾	10-12	c. i.		1,000	10	18	4	1	2	
Binghamton..... M	.....				3,954 w. i.	66,255	279,735	103,926	10,682	55,507	25,667
Chatham..... M	9,200	8-12	c. i.		1,800 w. i.	50,000	1,650				
Cold Spring..... M	2	6-12	c. i.			400	13,600	2,300			
Corning..... M	3.21	12-14			0.79 w. i.	4.4	11.92	6.08	1.49		
Cortland..... M	.....					30,654	79,511	26,935	4,418	5,809	2,012
Dolgeville..... M	¾	12				no record					
East Syracuse..... M	.....	12				5	3	3			
Elmira..... M	14,932	16-30			51,682 w. i.	20,073	322,728	92,532	32,342	8,922	26,829
Frankfort..... M	17,750	8	c. i. & wd.		2,000	13,700	18,200	3,400	3,800	3,400	
						4,235					
Glens Falls..... M	4	12-24	c. i. & cem.		1,682 w. i.	51,445	107,646	2,661	19,525	8,444	5,825
Gloversville..... M	.....	10-18	c. i.								
Hempstead..... M	.....									
Homer..... M	1½	8	c. i.		1 w. i.	4	2	1½			
Hoosick Falls..... M	.....				11½ miles, including w. i. and cement						
Hudson Falls..... P	3,000	12	c. i.		815 w. i.	42,990	12,705	14,859	10,838	3,100	5,500
Ithaca..... M	12,675	24	c. i.		1,750	11,937	120,574	38,250	7,000	23,375	
Jamestown..... M	9,300	16-24	c. i.		287,688 w. i.	42,425	233,566	39,406	7,763	9,003	55,189
Johnstown..... M	40,507	10-16	c. i.		1,660 w. i.	73,761	53,589	7,680	6,590		4,950
Kingston..... M	8	18-20	c. i.								
Lancaster..... M	1½	16									
Liberty..... M	¾	8	c. i.		250	7	4	2	1	½	
Little Falls..... M	10	14	c. i.			29,100	26,200	20,300	11,100	11,900	4,100
Malone..... M	1	12	c. i.		10 w. i.	6,732	2,000				
Mt. Kisco..... M	¾	8	c. i.			6.3	1	2			
Mt. Vernon..... P	39,400	16	c. i.			52,740	251,460	17,048	40,134	2,197	32,248
Newark..... M	.....					8,745	61,330	3,800	7,125	5,200	
Newburgh..... M	2,400	20-30	c. i.								
New Rochelle..... P	.....	24				152.4 miles.					
Olean..... M	3,000	12	c. i.		1,397 w. i.	110,226	54,575	36,708		23,350	4,682

For footnotes see page 632.

TABLE NO. 2.—DISTRIBUTION SYSTEM—Continued.

Ownership	Conduit to city		Length of street mains in service—cast iron unless otherwise indicated. w. l. = wrought iron; wd. = wood; st. = steel							
	Length	Size	Material	3" and under	4"	6"	8"	10"	12"	14" or larger
New York (Cont.):										
Oneonta.....	P	10,500	10-20	.....	.....	16,114	86,119	19,345	5,675	1,400
Ossining.....	M	10,717	12-16	c. l.	2,600 ^a	55,146	32,277	12,986	3,228	9,179
Peekskill.....	M	.....	.....	.....	.....	.....	.....	.....	.....	.....
Penn Yan.....	M	1 1/2	12	c. l.	.....	14 1/2 miles, 4-10-inch.	.....	.....	.....	.....
Pt. Jervis.....	P	.....	.....	.....	2,320 w. l.	45,510	36,838	5,395	8,753	13,910
Potsdam.....	M	.....	.....	.....	1,300 w. l.	.....	5 wd.	300	1,000	7,395
Poughkeepsie.....	M	12,038	12-16	c. l.	.....	.....	141,313	58,188	17,394	1,800
Rome.....	M	6	.....	concrete	.....	.....	.....	.....	.....	.....
Salamanca.....	M	4,700	18-10	c. l.	8,239 w. l.	14,653	46,046	24,402	2,336	.....
Schenectady.....	M	.....	.....	.....	.....	38,279	276,643	145,305	1,140	22,289
Seneca Falls.....	P	3	12-14	c. l.	1,400 w. l.	20,286	40,532	17,314	3,054	6,100
Sidney.....	P	4 3/4	.....	.....	1,200 w. l.	25,000	26,000	14,000	6,000	.....
Solvay.....	M	1	12	c. l.	.....	15,000	35,000	9,000	.....	10,000
Southampton.....	P	.....	.....	.....	.....	77,639	27,954	14,513	.....	.....
Syracuse.....	M	19	30	c. l.	.....	.....	.....	.....	.....	.....
Tarrytown.....	M	1	6-10	c. l.	641	38,864	43,862	12,267	29,520	3,222
Tonawanda.....	M	.....	.....	.....	.....	.....	.....	.....	.....	5,001
Troy.....	M	129,406	16-33	c. l. & st.	.....	38,198	215,939	102,135	17,148	77,537
Utica.....	P	20	20-24	c. l.	.....	16	91	23	7	13
Waterloo.....	P	1,500	14	vit.	2,799 w. l.	18,085	26,467	4,900	400	3,700
Waverly.....	M	4,856	12	c. l.	4,210 w. l.	47,540	10,567	1,672	2,952	3,831 ^a
Yonkers.....	M	9,100	24	c. l.	.....	74,361	335,268	301,508	.....	.....
North Carolina:										
Durham.....	M	.....	.....	42 mi., 4-20-in.	.....	.....	.....	.....	.....	.....
Edenton.....	M	.....	.....	.....	6,000 w. l.	16,000	10,000	1,400	.....	.....
Gastonia.....	M	9,400	12	c. l.	1,833 w. l.	6,801	55,945	8,423	1,585	.....
Henderson.....	P	2	12	c. l.	.....	1,000	30,000	6,000	.....	.....
Lenoir.....	M	1	12	c. l.	8 miles, 4-12-inch	.....	.....	.....	.....	.....
Monroe.....	M	.....	.....	.....	.....	6	4	3	1	.....
Oxford.....	P	.....	10	.....	500 w. l.	12,000	16,600	5,400	.....	.....
Raleigh.....	M	10,162	18	wd. & c. l.	45,172 w. l.	42,281	147,458	27,073	2,160	8,249
Rocky Mount.....	M	7,700	14	c. l.	5,000 w. l.	28,000	31,000	7,000	.....	11,342
Statesville.....	M	2 1/2	10	c. l.	4,500	13,400	21,000	7,800	8,000	.....
Thomasville.....	M	.....	.....	.....	1,000	2,000	32,700	3,008	1,600	1,200
Wilmington.....	M	2	24	c. l.	45 miles, 6-24-inch	.....	.....	.....	.....	.....
Winston-Salem.....	M	.....	8-16	.....	27,100 w. l.	65,325	91,150	39,600	38,900	7,900
North Dakota:										
Devil's Lake.....	P	4	4-10	.....	.....	.....	.....	.....	.....	.....
Fargo.....	M	.....	.....	.....	.....	25,365	145,148	11,121	7,665	4,518
Jamestown.....	M	.....	.....	.....	.....	3,040	27,740	11,400	4,940	7,225
Mandan.....	M	4,000	13	c. l.	2,400 w. l.	24,800	15,200	.....	.....	.....
Valley City.....	M	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wahpeton.....	M	3,200	15	.....	1,412 w. l.	26,633	5,096	2,780	496	.....
Williston.....	M	500	10	steel	200	18,000	5,000	4,000	.....	6,000
Ohio:										
Archbold.....	M	.....	.....	.....	.....	7,110	4,410	540	.....	.....
Ashtabula.....	P	4	10-12	c. l.	14.2 w. l.	1.25	18	4.7	6.95	4.81
Athens.....	M	0.5	10-12	c. l.	3,000	5,000	2,000	7,000	10,000	10,000
Barnesville.....	M	1 1/4	12	c. l.	.....	2,000	7	2 1/2	1	.....
Batavia.....	M	850	6	c. l.	780 w. l.	1,600	1,300	600	.....	.....
Bryan.....	M	.....	.....	.....	.....	5	2	.....	.....	.....
Cambridge.....	M	.....	24	wood	.....	30 miles 2-12-inch pipe	.....	.....	.....	.....
Chillicothe.....	P	3,300	16	brick &	1,281 w. l.	68,908	36,540	11,411	3,890	3,215
Cincinnati.....	M	4.25	84	concrete	50,259	863,592	1,734,779	253,080	381,994	158,060
Cleveland.....	M	.....	.....	.....	1.6	44.0	530.9	128.0	65.9	65.2
Conneaut.....	P	.....	.....	.....	.....	24,000	58,000	11,000	6,000	4,000
Coshocton.....	M	0.5	12	c. l.	.....	.....	.....	.....	.....	.....
Dayton.....	M	.....	.....	.....	.....	.....	.....	.....	.....	.....
Delaware.....	P	15,600	.....	.....	415 w. l.	29,739	62,052	11,045	3,835	1,000
Denton and	P	4,000	12	c. l.	.....	1,500	80,000	500	7,000	7,500
Uhrichsville.....	M	.....	.....	.....	.....	12,830	174,875	23,588	19,844	2,360
East Cleveland.....	M	.....	12	c. l.	.....	9,600	28,156	3,116	.....	4,700
Eaton.....	M	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gibsonburg.....	M	.....	.....	.....	.....	.....	.....	.....	.....	.....
Glouster.....	M	1/2	6	c. l.	.....	3	1.25	.....	.....	.....
Granville.....	M	.....	.....	.....	.....	4	1	.....	.....	.....
Hicksville.....	M	.....	.....	.....	.....	2	.....	1	0.5	.....
Huron.....	M	.....	.....	.....	1,500 w. l.	10,200	9,200	8,000	.....	.....
Kent.....	P	.....	.....	.....	5,506 w. l.	22,698	39,000	3,085	7,630	5,375
Leesburg.....	M	.....	6	.....	.....	2	1	.....	.....	.....
London.....	P	770	14	c. l.	.....	33,632	29,196	4,848	1,752	1,488
McConnellsville.....	M	75	8	c. l.	1,100 w. l.	1.75	1.5	1.1	700	418
Marietta.....	M	0.5	12	c. l.	.....	.....	.....	.....	.....	.....
Marion.....	P	3	16	c. l.	.....	20,086	149,867	39,604	5,247	1,838
Massillon.....	P	3	12-16	c. l.	.....	21,743	124,980	8,048	6,474	18,336
Maumee.....	M	.....	.....	.....	.....	.....	6,494 wd.	3,278 wd.	1,020 wd.	.....
Medina.....	M	.....	.....	.....	.....	12,593	21,370	4,940	4,790	.....
Mt. Gilead.....	P	1,869	8	c. l.	.....	10	7	3	.....	.....
Mt. Vernon.....	M	.....	12	c. l.	10,000 w. l.	13,944	11,935	.....	.....	.....
North Baltimore.....	P	0.5	12	c. l.	.....	44,000	30,000	1,700	14,108	.....
Norwood.....	M	.....	12	c. l.	.....	.....	.....	.....	.....	.....
Orrville.....	M	1	10	c. l.	.....	22,720	20,110	1,340	8,090	.....
Oxford.....	M	.....	10	c. l.	.....	.....	.....	.....	.....	.....
Painesville.....	M	4	12-14	.....	1,000	.....	.....	.....	.....	.....
Piqua.....	M	.....	.....	.....	6,000 w. l.	26,400	18,000	7,800	.....	.....
McAlester.....	M	18,048	14	c. l.	4,800	39,800	80,000	6,650	1,500	3,700
Ravenna.....	M	1.5	16	.....	30,200 w. l.	749	24,369	15,360	1,600	2,365
Reading.....	M	1	8-10	c. l.	.....	.....	.....	.....	.....	8,690
Sidney.....	M	.....	.....	.....	.....	.....	.....	.....	.....	.....
Springfield.....	M	9,000	20-24	c. l.	.....	.....	.....	.....	.....	.....
St. Marys.....	M	300	14	c. l.	.....	.....	.....	.....	.....	.....
Sandusky.....	M	.....	.....	.....	500 ^a	11,920	149,900	88,850	.....	21,166
Tiffin.....	P	.....	16-20	c. l.	2,860 w. l.	7,128	117,576	37,447	8,447	2,301
Toledo.....	M	.....	.....	.....	.....	332.73 miles of 4-36-inch pipe	.....	.....	.....	14,062
Toronto.....	M	2,500	10	c. l.	.....	21,300	51,600	7,601	2,240	5,040
Troy.....	M	.....	.....	.....	20,000 w. l.	.....	.....	.....	.....	2,600
Urbana.....	M	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wadsworth.....	M	.....	10	c. l.	5 w. l.	3	7	4	2	.....
Wauseon.....	M	3	10	c. l.	.....	7.5	2	1.5	.....	.....
Wapakoneta.....	M	.....	.....	.....	1,000 w. l.	27,300	37,600	3,000	3,000	1,700
Westerville.....	M	.....	.....	.....	5,000	12,000	10,000	1,000	.....	75
Xenia.....	P	.....	14	.....	10,510 w. l.	2,039	69,729	18,705	1,285	10,389

For footnotes see page 632.

TABLE NO. 2.—DISTRIBUTION SYSTEM—Continued.

Ownership	Conduit to city		Length of street mains in service—cast iron unless otherwise indicated. w. l. = wrought iron; wd. = wood; st. = steel							
	Length	Size	Material	3" and under	4"	6"	8"	10"	12"	14" or larger
Oklahoma:										
Altus.....M	.....	12	c. l.	.....	10,000 w.l.	623 ¹⁷	258 ¹⁷	161 ¹⁷	229 ¹⁷	8.5 ¹⁷
Bartlesville.....P	.....	14	c. l.	.....	2,500 w.l.	50,000	2,000	2,000	30,000	1,000
Durant.....M	.....	12	c. l.	.....	3 w.l.	6	4	3	9	.....
Hugo.....M	.....	8	c. l.	.....	.....	.....	.....	.....	.....	.....
Mangum.....M	.....	24	c. l.	.....	.....	.....	52.3	3.5	1.0	5.6
Muskogee.....M	.....	6	c. l.	.....	4,000 w.l.	26,000	.....	2,000	.....	3.5
Perry.....M	.....	10	c. l.	.....	.....	4.5	0.5	1.2	0.8	1.0
Sulphur.....M	.....	10	c. l.	.....	.....	.....	.....	.....	.....	.....
Oregon:										
Albany.....P	.....	.....	w. l.	.....	1,479	21,081	6,138	2,845	3,030	1,149
Corvallis.....M	.....	12	wood	.....	34,684 w.l.	27,466	2,899	.....	930	.....
Grant Pass.....P	9,411	12	steel	.....	33,447 w.l.	90,575 wd.	10,900 wd.	.....	5,525 wd.	11,500 wd.
Hood River.....M	6	14	wood	.....	26,100 w.l.	1,300 w.l.	7,400	3,300	1,650	2,100
Klamath Falls.....P	.....	.....	.....	.....	32,000 w.l.	6,000 w.l.	32,000 w.l.	2,000 w.l.	.....	.....
La Grande.....M	16	8-14	wd. & stl	.....	.....	.....	.....	.....	.....	.....
Marshfield.....P	8,400	12-14	stl. & wd	.....	.....	.....	.....	.....	.....	.....
Medford.....M	1	16	wood	.....	28 mi. 4-10 in.	.....	.....	.....	.....	.....
Portland.....M	24	42-52	steel	.....	77.4 w.l.	4.3 w.l.	3.6 w.l.	0.5 w.l.	0.8 w.l.	1.1 w.l.
					2.4 wd.	3.1 wd	1.2 wd.	0.4 wd.	0.1 wd.	1.8 wd.
Pennsylvania:										
Ashland.....M	6	.....	.....	.....	.....	3	3	.....	1.5	.....
Barnesboro.....M	3,600	6-8	c. l.	.....	2,800	4,240	5,980	.....	.....	.....
Bridgeport.....P	.....	8-10	.....	.....	330 w.l.	23,850	5,320	7,940	1,040	.....
Carbondale.....P	8	6-24	.....	.....	2,095 w.l.	.....	25	8	3	4.75
Catasauqua.....M	1,824	18	.....	.....	500 w.l.	1,000	14,259	6,662	1,100	2,200
Chambersburg.....M	64,800	14-16	c. l.	.....	5,000 w.l.	65,461	25,436	12,536	7,500	2,250
Duquesne.....M	5,500	14	c. l.	.....	800 w.l.	79,500	2,000	3,000	15,900	5,500
Easton.....P	.....	.....	.....	.....	532	17,175	102,317	3,665	4,123	37,000
Elizabethtown.....P	3,000	8	c. l.	.....	.....	18,000	6,000	7,000	.....	.....
Emporium.....P	9.4	6-12	c. l.	.....	1,900 w.l.	21,420	11,150	1,525	250	.....
Ford City.....M	1.1	10-12	c. l.	.....	.....	3	4	.....	.....	.....
Franklin.....M	.....	12	.....	.....	.....	.....	.....	.....	.....	.....
Gettysburg.....P	.....	12	c. l.	.....	15 miles 4-12-inch	.....	.....	.....	.....	.....
Greensburg ¹⁸.....P	70,000	12-14	c. l. & w. l.	.....	285	148,982	109,985	40,295	10,944	14,944
					1,570 w.l.	18,149 ¹¹	26,109 ¹¹	22,565 ¹¹	22,461 ¹¹	18,228
Hanover.....P	10	8-12	.....	.....	2 ³	6	3	1	.....	.....
Holidaysburg.....M	.....	10-12	c. l.	.....	50 miles total	.....	.....	.....	.....	.....
Indiana.....P	.....	12	c. l.	.....	1,245 ²	49,100	11,700	11,600	5,700	.....
Jersey Shore.....P	.....	10-6	c. l.	.....	.....	48,634	17,604	9,172	7,740	11,713
Juniata.....M	5 3/4	8-12	c. l.	.....	.....	25,000	1,000	4,000	.....	.....
Kane.....P	3	6-10	c. l.	.....	1,050 w.	35,000	16,300	6,600	20,160 ³	.....
Lancaster.....M	.....	.....	.....	.....	.....	14	24	10	.....	.....
Lebanon.....M	6 1/2	12-20	c. l.	.....	.....	56,005	59,166	32,732	3,995	6,000
Lehighton.....P	11	8-12	c. l.	.....	1 w. l.	6	10	2	.....	.....
Lewistown.....P	27	10-16	c. l.	.....	78 miles 4-16-inch	.....	.....	.....	.....	.....
McDonald.....P	31,700	10	c. l.	.....	3,551 w. l.	23,628	8,705	2,109	3,534	.....
Meadville.....M	.....	reservoir in city	.....	.....	36.9 miles 4-20-inch	.....	.....	.....	.....	.....
Media.....M	7,670	10-12	c. l.	.....	4,700	58,900	6,400	4,700	5,950	1,720
Meyersdale.....P	5 1/4	6-8	c. l.	.....	6,000	19,000	4,500	3,000	.....	950 ²
Minersville.....P	18,340	14	c. l.	.....	not known	.....	.....	.....	.....	.....
New Kensington.....P	.....	reservoir near city	.....	.....	25 miles 4 to 16-inch	.....	.....	.....	.....	.....
Norristown.....P	.....	12-24	.....	.....	250	84,703	56,935	17,583	1,037	21,143
Oil City.....M	24,285	8-24	c. l. & st.	.....	553 w. l.	30,410	125,418	22,928	980	10,960
Reading.....M	78,860	10-35	c. l.	.....	305	44,067	279,280	16,963	61,095	35,555
Shamokin.....P	84,826	12-24	.....	.....	19,913 ³	60,715	70,195	39,393	20,228	7,447
Steelton.....M	1 1/4	12	c. l.	.....	.....	.....	.....	.....	.....	.....
Titusville.....M	6,000	15	.....	.....	.....	.....	.....	.....	.....	.....
Towanda.....P	1	8-12	c. l.	.....	.....	30 miles 4 to 12-inch	.....	.....	.....	.....
Wellsboro.....P	13	4-12	vit.	.....	.....	26,745	12,897	3,400	628	4,006
Wilkesburg ¹⁰.....P	.....	16-42	c. l.	.....	.....	157,749	373,863	124,648	25,953	80,869
Rhode Island:										
Providence.....M	.....	.....	.....	.....	.....	422.4 miles 6 to 42-inch	.....	.....	.....	.....
Westerly.....M	.....	.....	.....	.....	.....	43.41 miles all sizes	.....	.....	.....	.....
Woonsocket.....M	18,000	12-20	c. l.	.....	.....	47,097	147,993	73,291	6,579	37,697
South Carolina:										
Abbeville.....M	1 1/4	6-8	c. l.	.....	.....	2 1/2	4 1/2	2 1/2	.....	.....
Anderson.....M	.....	.....	.....	.....	.....	.....	36 miles all sizes	.....	.....	.....
Beaufort.....M	.....	10	.....	.....	.....	600	4,000	1,500	.....	.....
Bennettsville.....M	.....	.....	.....	.....	.....	5 miles 4 to 10-inch	.....	.....	.....	.....
Charleston.....P	12	24	c. l.	.....	.....	54 miles all sizes	.....	.....	.....	.....
Cheraw.....M	1/2	10	c. l.	.....	.....	1/4 w. l.	14,400	13,400	5,600	2,000
Clinton.....M	.....	10	c. l.	.....	.....	.....	2	8	.....	.....
Florence.....M	.....	reservoir in city	.....	.....	.....	31,150	51,000	3,200	.....	.....
Georgetown.....M	.....	.....	.....	.....	.....	9 miles 4 to 10-inch	.....	.....	.....	.....
Union.....M	.....	10	c. l.	.....	.....	1	4	8	2	.....
South Dakota:										
Aberdeen.....M	.....	.....	.....	.....	.....	58,980	68,730	373	4,200	3,140
Brookings.....M	1 1/4	8	.....	.....	.....	20,348	21,418	12,850	795	966
Rapid City.....M	9	10-14	c. l. & wd.	.....	.....	16,600	8,700	3,500	5,000	.....
Watertown.....P	26,400	12	c. l.	.....	.....	29,600 w. l.	3,300 w. l.	6,100 w. l.	.....	.....
						7,457	15,360	8,115	9,408	4,315
Tennessee:										
Cleveland.....M	2 1/2	10	c. l.	.....	.....	.....	.....	.....	.....	.....
Fayetteville.....M	3,380	10	c. l.	.....	5,000 w. l.	19,023	25,206	2,715	2,115	1,073
Dyersburg.....M	1,600	10	.....	.....	1,000 w. l.	500	2,000	26,400	.....	.....
Franklin.....M	7,935	8	c. l.	.....	12,000 w. l.	.....	7,250	2,200	1,440	.....
Greenville.....M	5,775	6-8	c. l.	.....	4,350 w. l.	8,500	3,600	7,750 ²	.....	.....
Humboldt.....M	.....	.....	.....	.....	1 w. l.	234	3	0.7	.....	.....
Jackson.....M	.....	10	.....	.....	.....	2	15	1.64	0.42	1.07
La Follette.....P	.....	.....	.....	.....	17 w. l.	3	2	3	.....	1.35
Tullahoma.....M	.....	8	c. l.	.....	1,000	31,680	10,560	.....	.....	.....
Union City.....M	.....	.....	.....	.....	1 w. l.	7	1	0.1	0.5	.....
Texas:										
Austin.....M	5	20	.....	.....	.....	.....	.....	.....	.....	.....
Brownsville.....M	1 1/2	12	c. l.	.....	10,000 w. l.	10,000	3,000	10,000	.....	.....
Dublin.....M	.....	.....	.....	.....	6,000 w. l.	6,300	6,600	4,500	.....	.....
Ennis.....M	.....	.....	.....	.....	2,000 w. l.	37,012	3,175	13,725	.....	.....
Galveston.....M	13	30	c. l.	.....	.....	.....	198,394	132,661	4,582	16,055
Longview.....M	20,000	12	c. l.	3,000 w. l.	11,500	7,500	5,000	46,846
Mt. Pleasant.....M	8	cal.	4 w. l.	1 w. l.	1 w. l.

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TABLE NO. 2.—DISTRIBUTION SYSTEM—Continued.

Ownership	Conduit to city		Length of street mains in service—cast iron unless otherwise indicated. w. i. = wrought iron; wd. = wood; st. = steel							
	Length	Size material	3" and under	4"	6"	8"	10"	12"	14" or larger	
Texas: (Cont.)										
Nacogdoches	M	1	10	c. i.	.....	10,150	14,450	4,450	.....
Plainview	M	reservoir in city	6	.....	.....	.....	.....	.....	.....
Quanah	M	.....	.....	.....	.....	.....	.....	.....	.....
Stamford	P	9,000	8-12	c. i.	6,000 w. i.	55,000	2,000	.....	.....
Sweetwater	M	8½	12	c. i.	2 w. i.	7	4	3	1½	
Vernon	M	.....	8	c. i.	.....	16,320	8,500	3,420	.....
Utah:										
Lehi	M	9	10-12	wd. & vit.	3 w. i.	1 wd.	1 wd.	1 wd.	1 wd.	
Salt Lake City	M	.....	.....	.....	.....	.....	.....	.....	.....
Vermont:										
Barre	M	10.4	6-16	c. i.	13,579 w. i.	49,301	28,239	8,213	3,768	
Burlington	M	.....	10-24	.....	8 w. i.	43.19 miles	4-16-inch	.....	10,940
Essex Junction	M	4	8-10	c. i.	.....	.....	.....	.....	c. i. & cement
Fairhaven	M	3½	9	c. i.	1½ w. i.	4	¾	¾	.....
Newport	M	1	12-15	c. i.	.....	1,600	2,500	.....	4,000
Northfield	M	2,600	12	c. i.	.....	2,049	18,870	10,389	2,836
Richford	M	1	10-12	c. i.	.....	10	1	1	.....
St. Albans	M	9	12-14	c. i. & cem.	.....	5.32	6.25	1.75	0.42
Virginia:										
Charlottesville	M	7.9	10-18	.....	3,670 w. i.	22,200	19,000	6,000	.....
Danville	M	12,530	12-24	c. i.	69,803 w. i.	19,987	75,937	10,678	7,978	
Marion	M	.....	.....	.....	3,000 w. i.	3½	1	¾	13,197
Martinsville	M	4,000	6	.....	5,000 w. i.	10,000	16,000	.....	13,328
Radford	P	17,000	12	c. i.	2	6	1½	2	.....
Richmond	M	5,000	54	.....	15.68 w. i.	33.99	114.40	25.15	12.83
Washington:										
Auburn	M	19,500	8	wd. & c. i.	1,700 wd.	57,845 wd.	3,828 wd.	9,372 wd.	.....
Bellingham	M	3½	.....	wood	83 miles, 4-10-inch	.....	11,787 wd.	3,204 wd.	6,935 wd.
Blaine	P	8,864	.....	wood	7,168 w. i.	9,914 wd.	1,200	2,080	500 w. i.
Centralia	M	¾	10-12	wd. & st.	1,500 w. i.	16,800 st.	6,900 st.	6,400 st.	4,600 st.	
Chehalis	M	1,700	14	wood	950 wd.	16,800 wd.	44,450 wd.	.....	1,900 st.
Cheney	M	.....	.....	.....	1,250 w. i.	22,765 wd.	63,250 wd.	16,960 wd.	2,700 wd.
Edmonds	P	1	.....	wood	2,266 w. i.	14,754 w. i.	2,389 w. i.	1,700 w. i.	7,021 wd.
Ellensburg	M	7.5	16	wood	8½ miles wood pipe	31,246 wd.	2,400	8,419 wd.	1,367 wd.	
Goldbar	P	1½	.....	.....	.....	500 wd.	4,000 wd.	.....	3,437 wd.
Hoquiam	P	7,263	12-16	c. i. & wd.	74,146	534	19,660	25,025	13,764	
Montesano	P	1	10	steel	790 wd.	5,490	2,557	5,088	5,101	
Olympia	M	.....	12	wood	5,400 w. i.	2,626	11,005 wd.	8,975 wd.	20,083 wd.
Palouse	M	2,000	8	wood	14,581 wd.	2,573	6,345	4,282	3,315	
Pe Ell	P	2½	.....	.....	500 wd.	1,985 st.	4,900 st.	.....	9,740
Port Townsend	M	4,780	12	wood	2,300 w. i.	6,800 wd.	25,500 wd.	11,700 wd.	5,863 wd.	
Pullman	M	4,300	8-10	.....	500	1,500 w. i.	3,000 w. i.	2,000	.....
Seattle	M	62.62	42-60	steel	5,000 w. i.	8,000 wd.	2,000 wd.	1,000 wd.	.....
Snohomish	M	.....	12	c. i.	1,600 wd.	6,000 wd.	2,000 wd.	1,000 wd.	.....
Tolt	P	2	8	wood	425,793	31,029	227,226	1,273,912	64,309	
Walla Walla	M	.....	8	wood	32,503	65,076	160,869	285,592	1,614
Winlock	P	1,600	8	wood	½ wd.	5 wd.	7 wd.	2 wd.	270,799	
West Virginia:										
Fairmont	M	10,005	12	c. i.	25,000 w. i.	63,000	33,000	12,112	29,835	
Martinsburg	M	.....	.....	.....	12,000 w. i.	21,800	29,400	6,000	18,675
Piedmont	M	6	10	c. i.	5,000	10,000	10,000	4,000	60,604	
Princeton	P	6,900	10 c. i.	20,975 w. i.	26,462	13,388	10,440	.....	.....
Sistersville	M	2,300	10 c. i.	6,100 w. i.	20,829	15,040	2,620	2,820	1,940	
Wisconsin:										
Baraboo	M	6,500	10-12 c. i.	600	800	1,100	900	.....	.....
Beaver Dam	M	5,700	12 c. i.	3,700 st.	6,162 st.	64,744 st.	2,540 st.	3,077 st.	6,860 st.	
Columbus	M	.....	.....	.....	18,935	17,083	4,692	.....	.....
Eau Claire	M	.....	.....	.....	42,169	101,213	8,429	15,201	13,274
Fond du Lac	M	.....	.....	.....	22,852	61,355	55,412	4,201	9,757
Green Bay	P	.....	.....	.....	31,063	166,902	22,161	33,117	24,247
Janesville	M	.....	.....	.....	41,634 w. i.	12,478	87,800	25,351	5,707
Kaukauna	M	.....	.....	.....	130	44,902	4,804	1,953	2,877
Kenosha	M	.....	14-24	.....	29,230	166,917	32,421	7,862	4,910
Lake Geneva	M	3,419	10 c. i.	16,522	10,949	18,766	2,382	3,419	14,129	
Lancaster	M	11,089	8 c. i.	3,685	26,545	15,130	4,875	.....	.....
Milwaukee	M	.....	.....	.....	19,627	1,996,015	351,802	.....	263,036
New London	M	1	.....	.....	13,658	14,508	5,850	1,200	.....
Oconomowoc	M	.....	.....	.....	13,481	15,723	15,265	2,478	4,830
Oshkosh	M	931	24 c. i.	30,664 w. i.	48,007	186,022	35,818	14,066	13,136	
Pt. Washington	M	.....	.....	.....	1,338	8,780	18,022	7,431	5,543
Rhineland	M	375	12 c. i.	8,998 w. i.	20,974	51,760	5,733	7,006	157	
Richland Center	M	3,960	8-10	.....	31,738	17,302	3,564	1,320	.....
South Milwaukee	M	.....	.....	.....	.....	6-12-inch	.....	.....	.....
Sparta	M	.....	.....	.....	9,165 w. i.	25,923	21,440	9,192	258
Watertown	M	.....	.....	.....	17,768	82,938	5,575	6,492	3,423
Waukesha	M	.....	.....	.....	11,196	128,889	19,229	9,905	1,577
Waupaca	M	900	10	.....	1,822 w. i.	19,900	16,500	2,200	1,400
West Bend	M	3,545	8-10	c. i.	620	38,337	2,060	.....	.....
Wyoming:										
Cheyenne	M	27	.....	.....	.....	91,215	30,130	12,989	2,064
Green River	P	.....	6	c. i.	.....	9,235	4,523	60	17,880
Rock Springs	P	.....	8	c. i.	4,205 w. i.	22,841	6,735	14,244	8,040
Sheridan	M	6	6-10	c. i.	.....	13	5	4	.....
Canada:										
Brantford	M	.....	.....	.....	.....	103,238	157,499	34,694	8,488
Toronto	M	86,825	24-36	c. i.	9,764	81,382	2,184,793	27,182	4,082	
Winnipeg	M	.....	18-36	c. i.	8,869	156,052	835,127	299,747	514,033

¹ 16-inch; ² 32.7 miles under 4-inch, w. i. or steel; ³ 3-inch; ⁴ also includes Monterey, Carmel and Pebble Beach; ⁵ 1-2½-inch, w. i.; ⁶ 1½-inch or under; ⁷ all under 2-inch; ⁸ blocks; ⁹ 3-inch or under; ¹⁰ quasi municipal; ¹¹ wrought iron, cement lined; ¹² only one used; ¹³ one 24-inch and three 16-inch; 17,000 ft. 24-inch; 5,100 ft. 20-inch, and 32,500 ft. 16-inch; ¹⁴ 4-inch and under; ¹⁵ wood; ¹⁶ kalamain; ¹⁷ tons; ¹⁸ includes Youngwood, Jeannette, Penn. Manor and Irwin; ¹⁹ includes part of Pittsburgh; also Wilkensburg, Edgewood, Swissvale, No. Braddock, E. Pittsburgh, Turtle Creek, Chalfont, Wilmerding, Pitcairn, Penn. Wilkins, Braddock, No. Versailles, Patton and Rankin; ²⁰ Crest, Empire, Eureka, Gem, Hersey, Keystone, Trident and Torrent; ²¹ Protectus, Gem, Trident, Crest and Hersey; ²² 5-inch.

TABLE NO. 3—CONNECTIONS AND APPURTENANCES.

TABLE NO. 3—CONNECTIONS AND APPURTENANCES.										Private Fire Connections			
	Fire hydrants	For filling watering carts	Gate valves	connections	Meters	Motors and elevators supplied	Number	Size of taps	Kind of meter				
Alabama:													
Anniston	137	1	145	2,520	1,778	12	30	6	Hersey Detector				
Gadsden	210	...	130	1,800	1,800	none	4	6	None				
Jacksonville .....	...	...	...	...	...	...	...	...	...
Marion	60	1	4	202	180	none	3	2	Pittsburg				
Mobile	979	0	904	12,777	6,244	46	85	4 & 6	Detector				
Selma	166	5	125	1,630	1,600	none	6	4-6	.....			
Talladega	89	...	...	...	619	1	15	2-4-6	None	
Troy	52	2	36	840	720	1	6	4-6	None				
Tuskegee	25	...	14	150	140	4	5	6	None				
Union Springs..	50	1	20	325	200	none	2	4-6	Hersey				
Arkansas:													
Hot Springs....	146	18	...	...	2,700	10	20	2-6	None		
Mena	62	none	69	675	207	none	2	2	None				
Pine Bluff	312	none	425	3,692	2,617	none	17	2-4	None				
California:													
Glendale	210	...	410	2,406	2,406	...	...	...	.....
Grass Valley....	140	none	130	1,137	none	none	...	...	.....	
Lodi	110	2	50	900	2	1	8	2	None				
Monrovia .....	...	...	...	1,690	1,690	...	...	...	.....
Palo Alto	161	none	280	1,437	1,354	2	7	2-4	None				
Oxnard	90	...	...	850	6	...	10	1-2 1/2	None		
Pacific Grove....	119	44	...	3,722	3,270	...	9	1-3	None				
Santa Cruz	260	...	1,500	4,000	1,950	25	25	2-4-6	Protectus				
Pomona	267	none	600	3,200	2,500	3	10	2-4	None				
Riverside	515	15	...	4,733	546	...	30	2	None				
San Diego	1,116	242	3,067	14,830	14,830	...	110	2-6	By-Pass meters.				
Santa Rosa	184	10	95	2,575	2,109	5	10	2	None				
Sierra Madre	25	...	50	680	690	...	5	2	compound				
So. Pasadena....	107	...	...	...	...	...	32	2	.....			
Stockton	363	none	500	7,500	1,200	10	25	2-6	Protectus				
Whittier	150	...	330	2,250	1,170	...	14	1 1/2-4	Protectus & others				
Colorado:													
Colorado Spgs..	516	...	1,918	12,169	262	4	6	4-6	None				
Durango	70	6	85	1,000	4	...	12	2	None				
Grand Junction..	107	...	...	2,000	15	50	4	2	None		
	Length	Size	terial	under	4"	6"	8"	10"	12"	larger			
Greeley	119	1	140	2,100	176	4	...	...	.....	
Longmont	94	2	251	1,500	75	none	10	1 1/4-4	none				
Montrose	62	5	111	1,033	119	none	1	4	none				
Rocky Ford	39	...	45	700	700	none	1	2	none				
Connecticut:													
Bristol	162	none	339	2,152	1,829	...	20	4-8	none				
Danbury	450	none	600	no data	...	...	none	...	.....		
E. Hartford	160	3	125	2,100	36	none	12	4-8	none				
Hartford	1,775	none	4,042	15,404	15,077	none	...	2-8	detectors				
Litchfield	42	...	...	275	5	none	5	...	none		
Naugatuck	147	...	...	1,664	...	75	61	...	.....		
New Britain	743	115	1,360	5,222	5,341	17	...	4-6	none				
Norwich	444	none	...	...	1,134	9	30	4-6	Hersey-Trident		
Portland	87	none	88	660	10	none	none	...	none				
Putnam	95	...	105	1,078	100	2	8	6-8	.....			
Southington	162	5	350	1,241	126	8	15	2-8	none				
Suffield	35	none	...	300	347	4	2	6	.....			
Wallingford	136	6	...	1,612	308	6	13	6-8	Hersey or National if any				
Willimantic	233	...	161	1,599	1,395	1	75	1/2-1	.....			
Windsor	43	none	135	449	40	none	2	6-8	Hersey				
Winsted	248	6	312	1,220	126	12	13	4-6	.....			
Delaware:													
Milford	60	...	37	510	7	...	3	4	none				
District of Columbia:													
Washington	3,444	...	10,029	69,761	53,965	...	50	3-6	check or detector				
Florida:													
Daytona	69	none	80	750	750	none	27	1-4	none				
Live Oak	30	1	32	623	529	2	2	3	none				
Pensacola	279	none	183	3,400	3,000	3	2	2	Trident				
St. Augustine	148	none	136	1,200	600	2	12	2-6	none				
Georgia:													
Albany	130	...	145	1,550	1,600	...	6	4-6	.....			
Americus	124	2	147	1,218	611	none	12	4-6	Hersey				
Athens	272	none	...	1,704	1,704	5	10	6	none				
Columbus	261	none	405	4,000	1,600	none	31	4-8	Hersey				
Commerce	34	...	12	325	240	...	3	6	none				
Dublin	84	4	50	750	735	none	2	6	none				
Fort Valley	80	1	34	650	600	2	7	6	none				
Hawkinsville	85	1	58	350	300	1	3	6	none				
Madison	40	...	20	210	200	1	2	6	none				
Marietta	85	1	40	1,000	1,000	none	4	6-8	none				
Milledgeville	84	6	38	470	270	1	2	6	none				
Quitman	54	...	41	400	360	3	2	4-6	none				
Statesboro	75	1	10	500	100	...	1	6	none				
Thomasville	129	1	40	875	875	...	2	2-3	none				
Washington	50	25	18	250	225	5	4	2	.....			
Waynesboro	32	2	15	315	295	none	2	6	.....			
Idaho:													
Lewiston	127	48	405	1,720	1,000	5	10	2-4	Trident				
Sandpoint	78	3	...	1,330	39	none	none	...	none				
Twin Falls	52	none	140	1,650	2	2	2	6	none				
Weiser	114	...	122	600	1	1	6	2	none				
Illinois:													
Canton	189	...	225	1,425	1,460	1	1	6	none				
Chicago	29,842	none	25,471	299,897	20,768	...	...	2-12	v'l'cty, also on by-ps.		
Effingham	102	1	48	420	175	...	3	2	none				
Elgin	570	2	929	5,658	5,649	6	24	4-6	none				
Farmington	60	...	10	250	150	...	...	...	.....
Flora	73	...	25	...	...	...	1	4	none	
Freeport	395	...	...	4,494	3,718	5	5	4-6	Protectus		
Galesburg	475	...	200	3,000	3,000	20	4	4	none				
Geneva	129	none	69	700	700	none	6	6	none				
Harvard	63	none	32	700	700	none	2	2	.....			
Joliet	500	none	600	4,600	4,600	10	15	6	.....			
Kewanee	275	1	210	1,100	1,300	...	5	...	Hersey				
Macomb	160	2	...	850	760	...	...	...	.....
Mattoon	none	2	18	130	130	...	4	2-4	.....			
Metropolis	88	...	33	650	3	...	...	...	.....
Melrose Park	350	none	200	900	1,000	none	none	...	.....		
Mt. Carmel	128	2	40	1,500	25	none	3	4	Nat. compound				
Mt. Olive	55	2	50	430	9	...	5	2	.....			
Mt. Vernon	95	none	80	1,429	822	...	6	4	.....			
Normal	135	none	87	900	900	none	none	...	.....		

For footnotes see page 632.

TABLE NO. 3—CONNECTIONS AND APPURTENANCES—Continued.

	Fire hydrants	For filling watering carts	Gate valves	connections	Meters	Motors and elevators supplied	Private Fire Connections		
							Number	Size of taps	Kind of meter
Illinois: (Cont.)									
Oak Park	813	none	542	7,478	7,478	none	none	.....	.....
Paris	194	2	88	.....	150	1	5	.....	.....
Quincy	433	.....	651	7,440	4,516	3	20	4-6	Hersey
Rochelle	84	1	.....	750	750	.....	5	4-6	Hersey
Rock Island	650	.....	900	6,500	1,800	none	.....	4-6	.....
Sandwich	75	.....	.....	750	750	.....	.....	.....	.....
Springfield	852	.....	867	.....	.....	.....	2	4	Hersey
St. Charles	136	none	95	650	650	none	3	6	none
Sterling	282	none	235	2,498	1,447	none	13	4-6	Hersey
Streator	200	2	312	4,200	1,600	none	21	2-6	Compound
Waukegan	125	none	30	650	622	8	11	2-4	Empire
Waukegan	500	none	500	3,000	1,000	1	10	2-6	none
Indiana:									
Attica	70	none	40	800	none	none	3	4	none
Auburn	125	none	85	900	none	none	5	4-6	.....
Batesville	49	none	12	65	60	1	5	4-6	.....
Bedford	180	none	150	.....	25	1	none	.....	.....
Bluffton	112	none	50	825	825	.....	2	4	none
Brazil	132	2	101	1,200	950	.....	8	3	.....
Clinton	107	2	.....	1,400	85	none	3	.....	.....
Crawfordsville	202	2	46	2,800	900	.....	11	3-6	none
Delphi	58	1	.....	587	410	none	3	2	.....
Elwood	154	none	.....	1,400	675	none	3	2	.....
Fairmount	42	none	19	584	11	none	1	2 1/2	none
Gary	550	.....	1,250	4,500	4,400	2	6	3	Detector&Compound
Gas City	65	none	10	500	none	10	8	5	none
Goshen	204	6	.....	2,180	1,480	1	10	6	none
Greenfield	87	4	25	1,200	610	1	10	2-6	Keystone
Greensburg	165	1	.....	1,200	75	none	none	.....	.....
Kendallville	101	1	60	1,150	1,150	.....	3	6	none
Lafayette	361	.....	848	5,185	1,143	16	20	4-6	none
La Porte	286	.....	407	2,408	255	none	25	4-6	.....
Lebanon	152	2	.....	1,580	1,120	.....	2	4-6	none
Linton	80	3	65	1,300	130	.....	.....	.....	.....
Logansport	223	2	.....	4,400	.....	2	2	6	none
Mishawaka	233	.....	277	2,651	2,314	.....	10	4-8	.....
Montpelier	60	.....	20	248	140	none	none	.....	.....
New Castle	156	none	250	3,100	450	none	8	2-6	Hersey
Noblesville	110	1	90	1,050	100	1	none	.....	.....
North Manchester	64	1	28	512	491	3	4	6	none
Peru	252	1	300	3,248	89	none	17	6	none
Plymouth	77	.....	82	760	760	1	3	2-4	none
Portland .....	.....	.....	89	839	26	.....	5	2 1/2	none
Richmond	338	2	430	5,127	3,811	6	50	4-6	none
Rockport	37	.....	35	516	10	.....	2	2	.....
Rushville	122	2	126	1,400	1,200	none	2	4	none
Seymour	163	.....	76	1,300	127	1	6	.....	none
South Bend	1,118	.....	1,345	15,160	5,578	4	37	4-8	Hersey
Sullivan	89	3	.....	.....	400	1	2	1 1/2	Lambert
Terre Haute	1,203	.....	1,216	7,400	6,959	9	19	4	Hersey detect. pro.
Union City	114	none	.....	1,400	1,000	.....	5	2,4,6	none
Vincennes	285	.....	8,150	3,000	650	4	9	6	Comp. & Detector
W. Terre Haute	59	none	.....	200	none	none	1	2	none
Iowa:									
Albia	57	1	.....	383	380	.....	.....	.....	.....
Ames	100	.....	200	1,125	1,125	.....	1	2	.....
Atlantic	125	.....	100	1,200	250	.....	3	4-6	none
Boone	341	1	235	1,800	1,795	.....	5	2-6	none
Burlington	531	4	577	5,031	199	15	20	4-6	none
Cedar Falls	151	none	191	1,560	1,151	.....	2	6-8	none
Cedar Rapids	568	none	.....	7,840	7,630	.....	.....	6	Hersey
Charles City	114	4	84	950	1,003	.....	3	6	none
Cherokee	72	none	97	920	935	.....	3	.....	none
Council Bluffs	438	7	685	6,491	6,044	4	6	6	none
Creston	142	none	36	950	900	none	none	.....	.....
Denison	60	none	80	980	950	none	5	.....	none
Dubuque	442	6	883	4,800	5,000	.....	42	4-6	none
Fairfield	78	1	65	1,050	1,000	none	4	4-6	none
Glenwood	23	none	12	200	230	none	none	.....	.....
Indianola	80	none	78	300	300	none	none	.....	.....
Knoxville	60	1	65	559	559	none	2	4	none
Maquoketa	112	1	80	800	1,000	none	none	.....	.....
Mason City	266	1	529	2,862	2,862	none	4	46	Protectus on one
Mt. Pleasant	77	none	58	555	600	none	3	4	Neptune
Muscatine	459	.....	431	3,500	2,000	none	12	6	.....
Osage	42	1	10	700	700	none	none	.....	.....
Osceola	29	1	8	180	180	.....	none	.....	.....
Red Oak	103	1	144	1,415	1,415	3	4	4	none
Sioux City	795	.....	1,292	8,737	8,500	.....	22	4-6	none
Washington	137	2	50	984	984	1	5	2-4	none
Winterset	40	.....	33	.....	300	none	none	.....	.....
Kansas:									
Coffeyville	179	none	220	2,300	2,300	2	8	4	none
Columbus	83	1	28	850	575	1	none	5/8-3/4	.....
Emporia	192	1	.....	2,368	2,368	none	1	2	none
Ft. Scott	200	4	.....	2,200	1,816	.....	.....	.....	.....
Fredonia	75	1	20	850	550	none	4	2-8	none
Girard	74	2	32	462	388	none	3	.....	none
Great Bend	81	3	63	600	552	none	1	2-4	sealed valve
Hiawatha	62	none	70	625	658	1	5	2	none
Horton	52	none	26	345	345	none	none	.....	.....
Independence	163	3	252	2,600	1,400	1	10	2-2 1/2	none
Junction City	103	1	169	1,500	1,504	.....	1	2	disk
Larned	129	2	63	675	670	none	5	1-4	none
McPherson	80	1	50	1,173	955	4	4	2-4	detector
Manhattan	146	3	254	1,704	1,798	none	7	2	none
Neodesha	45	4	84	960	900	none	10	2	.....
Olathe	91	1	.....	600	600	none	none	.....	.....
Osage City	78	2	.....	425	400	2	9	1-2	.....
Osawatomie	64	none	40	375	300	none	none	.....	.....
Parsons	153	2	142	2,950	2,970	4	6	2	Hersey
Pittsburg	308	3	517	4,707	1,160	none	none	.....	none

For footnotes see page 632.

TABLE NO. 3—CONNECTIONS AND APPURTENANCES—Continued.

	Fire hydrants	For filling watering carts	Gate valves	connections	Meters	Motors and elevators supplied	Private Fire Connections		
							Number	Size of taps	Kind of meter
Kentucky:									
Bowling Green....	237	none	400	2,700	265	.....	2	2-4	none
Dayton	112	.....	.....	.....	.....	.....	.....	.....	.....
Franklin	54	none	15	300	4	none	none	.....	.....
Hopkinsville	143	none	.....	2,033	160	5	12	2-6	compound or none
Lexington	661	.....	870	7,735	7,213	3	15	4	Hersey
Louisville	1,575	25	6,163	45,500	5,748	.....	300	1½-8	none
Maysville	91	none	80	1,300	120	20	24	2-8	none
Middlesborough ...	60	none	90	1,050	400	none	9	4	none
Paris	123	none	75	1,150	40	4	3	4	none
Princeton	90	.....	65	400	400	none	1	3	none
Richmond	112	none	.....	777	75	none	1	6	none
Russellville	34	1	12	300	300	none	5	4	none
Louisiana:									
Morgan City	85	.....	78	400	12	.....	2	4-6	.....
Natchitoches	38	3	14	422	300	.....	4	1½	none
New Orleans	5,507	none	52.50	73,000	52,847	.....	.....	4-12	Hersey—utility
Ruston	78	none	30	425	400	2	4	4	none
Maine:									
Auburn	191	.....	631	2,500	67	.....	11	.....	.....
Augusta	179	15	491	2,250	155	3	22	2-8	Empire compound
Bath .....	.....	.....	284	2,396	284	.....	.....	.....	.....
Dexter	86	5	75	600	533	10	25	.....	none
Fairfield .....	.....	.....	3	90	none	none	.....	.....	.....
Fort Kent	42	.....	12	140	none	none	2	2	none
Gardiner	102	3	244	1,524	24	.....	10	4-8	.....
Houlton	107	4	.....	1,070	2	none	1	6	none
Norway	41	2	40	450	6	2	3	1½-6	none
Rumford .....	.....	.....	.....	.....	.....	.....	6	6	Hersey
South Paris	37	.....	.....	260	7	.....	5	6	none
Van Buren	52	4	34	441	none	none	1	8	none
Maryland:									
Easton	49	.....	50	700	699	none	2	6	none
Frederick	146	.....	250	2,500	71	.....	2	6	.....
Hagerstown	224	12	354	4,400	4,200	2	15	4-6	none
Massachusetts									
Andover	377	10	.....	1,550	1,300	2	3	6	none
Attleboro	490	12	.....	2,965	2,938	1	12	6	none
Belmont	245	27	468	1,574	1,574	none	5	4-6	Hersey-F. M.
Brockton	1,180	40	2,030	9,676	9,611	13	.....	4-6	none
Cambridge	1,201	74	.....	16,902	6,000	.....	187	4-8	Hersey-Neptune
Cherry Valley.....	71	none	70	365	120	none	10	6-10	none
Clinton	293	11	212	2,056	1,680	14	108	4-6	none
Cohasset	95	8	.....	695	25	3	3	4-6	none
Concord	246	.....	294	1,324	48	1	4	4-6	Hersey
Everett	585	20	.....	5,980	3,267	2	12	4-6	Neptune & Hersey
Fall River	1,516	25	1,700	10,000	10,150	.....	340	6-8	Hersey & Protective
Fitchburg	896	75	923	5,000	5,041	45	.....	4-10	.....
Frammingham	278	10	627	2,508	2,598	.....	20	4-12	Hersey
Franklin	145	2	124	1,000	1,004	none	12	4-8	Empire Compound
Gloucester	381	29	647	5,170	483	none	15	6	Crown ¹²
Greenfield	347	7	498	2,568	276	18	12	6-8	none
Holyoke	754	2	1,317	4,692	428	.....	267	4-8	none
Hudson	192	3	308	1,228	1,220	3	5	5	none
Lawrence	898	.....	1,846	8,452	7,936	.....	25	2-10	.....
Lenox	50	.....	311	308	308	2	6	3	Protectus
Lynn	1,178	.....	1,425	16,726	7,900	5	179	4-6	none
Maynard	110	5	225	1,047	1,051	2	3	6-8	none
Mansfield	144	.....	.....	1,200	700	1	7	4-6	none
Medway	112	none	88	504	229	none	2	6	none
Milton	432	.....	684	1,965	2,044	.....	31	6	none
Monson	97	8	120	486	225	4	6	6	none
New Bedford.....	1,793	.....	2,271	15,126	14,481	.....	368	all-10	none
Newburyport	245	22	246	3,007	108	none	22	4-8	none
Newton	1,092	69	1,045	9,606	8,753	15	25	2-8	.....
North Adams	401	none	.....	3,286	91	380	31	6	Gem & others
Northampton	517	18	.....	3,800	138	9	14	4-6	none
North Attleboro..	266	4	.....	1,454	1,454	none	7	6-8	none
North Easton.....	95	8	80	600	600	4	7	4-6	Hersey
Norton	63	none	57	255	6	none	5	6-8	none
Orange	142	1	171	920	920	.....	9	4-10	none
Oxford	44	.....	32	450	267	none	24	6	.....
Peabody	445	.....	409	3,226	2,407	6	37	6 or under	none
Pepperell	154	.....	152	602	486	.....	8	1-8	Detector
Randolph	177	none	162	1,162	425	none	4	none	.....
Reading	201	8	306	1,705	1,596	none	6	6-8	none
Saugus	320	.....	202	2,024	709	.....	.....	.....	.....
Somerville	1,160	79	1,733	13,420	9,763	1	30	2-10	none
So Hadley Falls..	120	15	69	560	41	2	8	6-8	none
Spencer	103	7	112	885	840	.....	8	2-8	none
Springfield	1,936	173	5,661	15,248	14,597	406	170	4-10	Hersey
Swampscott	188	6	439	1,873	1,873	none	2	4	none
Taunton	1,077	48	785	5,846	3,565	22	50	4-8	none
Turner's Falls....	125	3	140	650	40	.....	12	6	Empire compound
Walpole	241	5	160	1,120	905	4	11	4-8	none
Waltham	511	36	864	4,288	2,299	10	10	4-10	none
Weymouth	453	.....	618	3,914	2,000	5	10	4-10	Hersey & Premier
Winchendon	183	6	246	950	940	1	15	6-8	none
Winthrop	296	15	695	2,970	2,899	none	2	2-6	Hersey
Worcester	2,682	2	4,419	20,796	20,633	612	.....	6	Detector
Michigan:									
Albion	175	none	180	1,500	25	1	5	4-6	none
Allegan	113	3	92	1,190	12	none	2	6	none
Alpena	241	.....	.....	3,370	195	.....	.....	.....	.....
Battle Creek.....	.....	none	633	7,360	7,112	5	10	6	Detector
Belding	58	none	87	827	827	.....	5	6-8	.....
Bessemer	78	1	117	730	39	.....	none	.....	.....
Big Rapids.....	139	4	57	725	10	.....	3	4	none
Coldwater	126	6	.....	1,753	15	none	6	4	none
Charlotte	127	2	217	1,408	886	2	3	6	none
Crystal Falls.....	56	none	44	431	3	none	none	.....	.....
Dowagiac	105	.....	100	900	900	none	4	4-6	Gem
Essexville	32	.....	11	120	70	.....	.....	.....	.....

For footnotes see page 632.

TABLE NO. 3—CONNECTIONS AND APPURTENANCES—Continued.

	Fire hydrants	For filling watering carts	Gate valves	Service connections	Meters	Motors and elevators supplied	Private Fire Connections		
							Number	Size of taps	Kind of meter
Michigan: (Cont.)									
Flint	520	.....	.....	9,600	9,980	.....	16	4-8	none
Grand Rapids.....	2,104	.....	2,732	25,530	20,914	66	317	6	none
Hastings	80	.....	210	1,400	550	.....	10	4-6	none
Highland Park	411	.....	.....	6,339	247	.....	2	6	Protectors
Holland .....	.....	.....	.....	2,509	2,513	.....	14	2-8	Hersey
Houghton.....	80	3	304	1,100	1,160	2	12	2	none
Ionia.....	140	2	110	1,500	600	3	4	6	none
Ishpeming	146	.....	.....	2,075	1,643	.....	3	1½	Trident
Jackson	893	.....	1,078	8,758	8,492	.....	.....	2-6	none
Ludington	235	.....	85	1,800	1,600	1	5	6	Hersey
Manistee	202	.....	331	1,959	1,060	1	12	2-6	none
Marine City	85	1	76	500	none	none	300	¾ & ¾	none
Marquette	226	2	398	2,300	1,200	6	15	2-6	none
Mt. Clemens	239	6	301	1,897	1,750	.....	4	2½	none
Muskegon	639	.....	695	5,788	3,634	.....	.....	6	Hersey
Norway	115	3	118	850	105	3	.....	.....	.....
Onaway	48	.....	24	465	18	.....	8	2-4	none
Pawpaw	40	1	50	400	400	.....	.....	.....	.....
Sturgis	97	.....	56	1,250	1,275	.....	8	2-6	none
Traverse City	260	.....	.....	2,350	1,200	6	4	6	none
Yale	41	.....	19	350	14	.....	4	1½-4	none
Minnesota:									
Alexandria	47	1	25	300	.....	.....	20	1½	none
Bemidji	92	3	62	450	425	.....	5	1½-2½	none
Brainerd	108	3	52	1,750	90	none	none	.....	.....
Cloquet	116	.....	122	970	970	.....	4	2	none
Duluth	1,095	.....	.....	11,952	10,781	14	125	4-8	none
Eveleth	100	3	400	984	26	1	9	2-4	none
Fairmont	86	3	40	700	690	3	5	2-4	none
Faribault	130	17	318	954	954	none	15	6	none
Lake City	84	11	64	642	642	.....	3	2-4	none
Melrose	30	.....	12	220	35	.....	2	2	none
New Ulm.....	121	3	130	700	754	.....	1	10	none
Northfield	104	.....	63	.....	558	.....	.....	.....	.....
Owatonna	115	8	120	1,180	290	.....	10	2-6	none
Rochester	275	7	122	2,000	1,700	.....	.....	¾ & ¾	none
St. Paul.....	3,721	.....	3,754	40,858	34,879	.....	210	4-6	none
St. Peter.....	43	3	22	314	313	.....	2	3	.....
Staples	53	1	12	160	160	.....	5	¾	.....
Stillwater	187	4	116	1,096	none	2	6	4-6	none
Thief River Falls...	70	2	35	600	600	.....	.....	.....	.....
Two Harbors.....	38	.....	38	1,000	.....	.....	.....	.....	.....
Virginia	129	.....	.....	1,700	1,200	.....	12	2-4	.....
Willmar	63	1	35	650	640	1	5	2	none
Mississippi:									
Corinth	125	2	50	700	6	.....	6	3-6	none
Greenwood	150	.....	.....	1,500	.....	.....	6	6	none
Jackson	567	12	.....	4,500	2,500	5	.....	4-6	Lindent, Crest. & National Compound
Lexington	84	.....	80	250	1	2	1	6	none
Natchez	210	52	138	1,375	1,272	5	12	4-6	Hersey
Pascagoula	43	.....	10	400	35	.....	.....	¾	none
Lupelo	56	.....	25	540	540	.....	8	6	.....
Water Valley.....	70	.....	60	725	725	.....	3	2	none
Missouri:									
Albany	27	.....	12	300	300	.....	1	1½	.....
Butler	84	1	35	553	476	.....	.....	6	.....
Carrollton	76	.....	32	525	135	.....	2	6	none
Cartersville (see Webb City)	.....	.....	.....	.....	.....	.....	.....	.....	.....
De Soto	62	.....	.....	.....	350	.....	.....	2	Buffalo
Farmington	37	.....	10	350	350	.....	1	.....	.....
Fulton	83	.....	40	760	480	2	.....	.....	.....
Hannibal	169	.....	.....	3,481	468	1	4	.....	none
Macon	63	.....	42	545	182	.....	24	.....	.....
Mexico	90	.....	90	900	600	.....	.....	.....	.....
Rich Hill .....	.....	1	.....	250	12	2	.....	.....	.....
St. Louis	11,781	1,913	12,622	117,284 ^a	8,326	.....	768	3-8	none or detector
Slater	62	1	45	300	295	.....	.....	.....	.....
Trenton	103	.....	95	960	960	.....	1	2	none
Washington	64	1	35	405	247	3	2	6	none
Webb City	249	3	.....	2,586	2,129	.....	3	2	.....
West Plains	30	2	18	252	234	.....	3	6	none
Montana:									
Anaconda	62	.....	350	2,631	.....	2	28	4	.....
Billings	198	.....	236	3,000	700	.....	6	2-6	none
Deer Lodge	32	.....	78	600	2	.....	5	2-4	none
Glendine	72	3	69	640	440	.....	.....	.....	.....
Great Falls	440	.....	387	3,600	220	.....	.....	.....	.....
Havre	85	.....	66	717	61	.....	3	1	none
Kalspell	226	.....	165	1,286	780	.....	4	6	none
Libby	20	3	58	276	.....	1	2	2½	none
Livingston	111	2	149	1,327	72	.....	18	.....	.....
Nebraska:									
Auburn	80	.....	80	450	450	.....	3	2	none
Grand Island	140	3	160	2,100	2,100	3	3	6	.....
Hastings	191	5	.....	2,534	2,534	.....	4	4	none
Norfolk	215	2	123	1,032	1,020	.....	1	4	none
North Platte	75	.....	65	.....	1,263	.....	.....	.....	.....
Schuyler	53	3	30	400	400	.....	.....	.....	.....
Nevada:									
Carson City	40	2	60	700	515	.....	4	2	Trident
New Hampshire:									
Berlin	122	.....	206	1,458	365	.....	6	6-8	none
Claremont	133	4	333	1,293	904	1	12	6	.....
Concord	455	44	1,039	3,858	2,500	10	18	2-10	none
Dover	223	6	290	1,992	1,589	1	17	4-12	none
Franklin	120	9	145	649	1,000	.....	15	.....	none
Keene	314	.....	513	2,302	2,276	18	7	6-8	none
Lebanon	81	9	149	759	322	5	.....	.....	none
Manchester	990	90	1,421	8,185	6,634	.....	107	4-12	none
Milford	86	3	179	637	331	.....	24	.....	Hersey
Newport	94	.....	132	695	4	3	4	6	none
Rochester	190	15	500	1,650	1,125	.....	7	6-8	none
New Jersey:									
Atlantic City	900	.....	.....	7,297	7,267	.....	22	4-6	Hersey
Branchville	42	none	20	110	12	2	1	4	none
Bridgeton	288	.....	486	3,333	none	7	43	4	none
Burlington	150	.....	140	2,400	4	.....	.....	.....	.....
Camden	1,201	.....	3,500	23,500	1,270	.....	35	6-8	none

For footnotes see page 632.

TABLE NO. 3—CONNECTIONS AND APPURTENANCES—Continued.

	Fire hydrants	For filling watering carts	Gate valves	connections	Meters	Motors and elevators supplied	Number	Size of taps	Kind of meter
New Jersey: (Cont.)									
Chatham	112		312	510	383		1	4	Velocity.
Dover	178		400	1,700	1,400	1	5	6	none
East Orange	885		1,912	8,295	6,615	3	9	4-8	Detector.
Freehold	79	12	92	900	105		1	6	
Gloucester	106		165	2,600	4	1	none		
Irvington	258		445	4,883	3,200		6	6	
Jamesburg	42		30	235	124				
Lambertville	40		25	525	15	2	3	4-6	
Jersey City	2,930		4,238	36,737	7,717				
Milittown	54		36	274	274				
Montclair	645	19	715	5,560	5,038		6	4-6	Trident or none
Netcong			2	269	21	1	1		none
Newton	130	1	100	1,200	500		3	6	none
Nutley	200		300	1,560	1,560		1	6	none
Pleasantville	105			1,650	100		7	2-6	none
Rahway	189		245	2,201	169	4	10	4-6	Hersey
Ridgewood	208	3	250	2,400	50	none			
Wallington	46			560	200		1	4	Hersey
Washington	43	3	116	840	9				
West Orange	320		297	2,269			5	2-6	Trident, Hersey
New Mexico:									
Las Vegas	82		105	1,500	100	2	6	2	none
Raton	60	3	140	1,000	120		4	2	none
New York:									
Albany	1,407			19,991	7,810	60		3-6	none
Amityville	95	3	85	400	2		4	2	
Amsterdam	584	4	816	4,538	410	6	18		none
Auburn	688		731	7,530	894	6	25	4-12	Hersey
Beacon	224	3	300	1,600	1,550		49	4-6	Hersey
Binghamton	980	25	1,650	11,000	9,850	16	125	4-6	none
Chatham	55	3	52	530	360				
Cold Spring	51		58	486	382		3	2	none
Corning	284	8	378	2,921	2,978	17	12	4-6	none
Cortland	251	1	284	2,419	2,210	11	23	4-6	Hersey
Dolgeville	62		no record	690		20	6	6	none
East Syracuse	65		60	700	695		1	6	none
Elmira	576			9,481	8,916			3-8	few metered
Frankfort	90		80	825	740		5	2-8	none
Glens Falls	343	50	448	3,605		2	12	6	Hersey
Gloversville	370		492	4,242	4,187	3	42	4-6	
Hempstead	171			1,900	20				
Homer	55		56	420	85	1	3	4	none
Hoosick Falls	108		139	1,500	21		5	6	none
Hudson Falls	135	4	94	1,295	90		20	4-6	none
Ithaca	264		1,000	4,000	4,000	12	10	6	none
Jamestown	549		952	9,822	8,213	3	142	4-6	Hersey
Johnstown	216		412	2,494	250	3	23	4-6	
Kingston	480	12	350	6,220	200	40	15	6	
Lancaster	120		210	1,015	1,124		2	6	none
Liberty	65	1	56	575	550	5	10	3/4-4	none
Little Falls	161			2,255	568		12	4-6	Hersey
Malone	112	4	423	1,586	3	6	3	6	Neptune
Mt. Kisco			25	550	500	2			
Mt. Vernon	1,744		1,169	6,000	5,800		6	4-6	Hersey
Newark	170			1,355	1,048		13	6	none
Newburgh	448	5	632	4,700	31	1			
New Rochelle	946			7,824	7,824				
Olean	370		827		4,000	8	11	4-6	Hersey
Oneonta	149	3	364	2,500	70		5	4	none
Ossining	193	1	173	1,848	1,744	6	2	4-6	none
Peekskill					2,500		10	4	none
Penn Yan	122			1,472	550		5	4-6	none
Pt. Jervis	157		120		4	5	3	4	
Potsdam	110		170	1,000			3	2-6	
Poughkeepsie	702		700	5,450	5,450	9	12	4-6	none
Rome	370		500	4,500	120	3	25	4-6	
Salamanca	151	1	216	1,950	23		9	6	none
Schenectady	1,548		2,636	14,799	1,065	1	120	4-8	none
Seneca Falls	139	6	155	1,900	66		5	4-8	none
Sidney	54		84	660		18	2	6-8	none
Solvay	155		100	950	940		3	8-12	none
Southampton	126		105	829	829		22	4	none
Syracuse	3,291		3,088	29,993	27,508		207	4-6	none
Tarrytown	241		382	1,179	995		8	4-6	Crown
Tonawanda	274		40	2,200	25		3	6	Hersey
Troy	1,236		2,217	12,595	300	50	150	4-8	none
Utica	1,200			15,000	15,000				
Waterloo	76	1	65	850	130	1	3	4-6	none
Waverly	69	16	106	1,300	500	5	4	4-8	none
Yonkers	1,886		1,376	10,154	10,262			3-6	none
North Carolina:									
Durham	263	5	960	4,075	1,850	1	110	2-8	none
Edenton	44	1	40	335	62		3	4-6	none
Gastonia	130		97	1,019	855		14	2-8	none
Henderson	120		50	700	600		8	6	
Lenoir	115			450	450	4	5	6	
Monroe	150		100	1,000	1,000		3	4	Hersey & Trident
Oxford	64	1	18	500	470		5	4-6	Hersey
Raleigh	351		466	3,985	1,167	1	30	4-6	none
Rocky Mount	129		96	1,555	1,420		4	4-6	none
Statesville	100		55	832	800		100	6	none
Thomasville	100		50	400	325		50	1 3/4	none
Wilmington	265		332	7,100	2,200		6	4-8	Detector
Winston-Salem	373	none	369						
North Dakota:									
Devil's Lake	85	2	30	540	4	none	22	2	none
Fargo	407	1		3,000	2,800		15	4-6	Detector
Jamestown	75	3	85	620	616	none	none		
Mandan	52	1	40	475	475	none	none		
Valley City	101	3		560	560				
Wahpeton	38		45	600	15				
Williston	90	4	32	700	500	40	10	1-2	none
Ohio:									
Archbold	56	none	25	100	100	1	none		
Ashtabula	315		444	4,805	4,375	1	7	6	Detector
Athens	75	none	30	1,800	250	10	20	2-4	none
Barnesville	92		80	650	650	1	13	1-6	none
Batavia	32		48	211	35	none	1	3	none
Bryan	93		46	650	631		2	4	none
Cambridge	196		250	2,200	none	300	100	2-6	none

For footnotes see page 632.

TABLE NO. 3—CONNECTIONS AND APPURTENANCES—Continued.

Ohio: (Cont.)	Fire hydrants	For filling watering carts	Gate valves connections	Meters	Motors and elevators supplied	Private Fire Connections			
						Number	Size of taps	Kind of meter	
Chillicothe	175	none	179	3,200	750	3	8	4-6	Detector
Cincinnati	6,429	none	.....	61,616	42,525	373	.....	4-6	none
Cleveland	11,693	.....	21,709	100,803	98,418	.....	524	1½-10	By-Pass
Conneaut	227	10	179	2,500	1,250	1	6	6	.....
Coshocton	172	.....	.....	2,865	138	8	12	2-6	none
Dayton	2,082	.....	6,000	34,196	27,996	.....	350	2-10	none
Delaware	274	.....	178	2,255	1,395	1	.....	.....	.....
Denison and Union	190	2	156	2,300	2,000	1	none	.....	.....
East Cleveland	543	none	1,021	3,984	3,984	none	4	6	none
Eaton	87	none	66	980	538	none	4	1	none
Gibsonburg	52	.....	35	455	308	.....	11	.....	Lambert
Glouster	60	none	4	312	40	none	4	1	none
Granville	37	3	32	400	150	none	1	1½	none
Hicksville	42	1	12	412	162	2	5	2	.....
Huron	47	none	48	312	2	none	.....	.....	.....
Kent	101	1	.....	1,200	1,200	2	2	6	By-Pass
Leesburg	27	.....	25	89	89	.....	.....	.....	.....
London	130	none	70	800	40	.....	1	6	.....
McConnellsville	48	1	28	407	62	1	none	.....	.....
Marletta	300	12	.....	4,000	1,000	15	25	2	.....
Marion	522	.....	670	3,969	3,200	2	10	2-6	Crown
Massillon	327	3	239	3,500	1,795	2	10	1-6	Detector
Maumee	50	.....	41	175	147	.....	.....	.....	.....
Medina	75	.....	150	710	707	.....	3	4-6	none
Mt. Gilead	51	1	33	365	326	1	1	4	none
Mt. Vernon	150	.....	.....	.....	300	6	6	4	none
North Baltimore	81	.....	65	270	115	none	2	4-6	.....
Norwood	400	.....	.....	.....	.....	2	.....	4-6	By-Pass
Orrville	76	none	818	1,104	1,104	none	3	6	Hersey
Oxford	78	.....	90	620	298	4	25	2	none
Painesville	150	1	175	1,800	1,800	3	4	1-2	Keystone
Piqua	280	.....	300	3,500	none	27	30	4-6	none
McAlester	236	none	168	2,244	1,745	none	6	4-6	none
Ravenna	139	.....	250	1,756	25	.....	.....	.....	.....
Reading	76	none	97	592	592	.....	3	.....	Hersey & Worthing-
Sidney	146	6	135	1,700	1,700	.....	6	6	ton
Springfield	900	.....	1,231	12,000	4,000	.....	43	.....	none
St. Marys	100	2	60	1,200	575	none	4	6	Detector
Sandusky	405	.....	750	6,020	5,035	13	13	4-6	none
Tiffin	228	3	.....	3,169	2,250	.....	7	3-6	Detector & Protectus
Toledo	2,390	.....	2,612	42,002	33,886	242	184	4-8	.....
Toronto	95	none	.....	1,000	75	1	none	.....	.....
Troy	164	12	310	1,950	830	none	23	6	none
Urbana	185	.....	200	1,680	270	.....	6	2-6	none
Wadsworth	48	none	75	982	none	.....	6	2½-6	none
Wauseon	84	.....	40	890	850	.....	none	.....	.....
Wapakoneta	125	1	229	1,003	988	2	4	2-8	none
Westerville	90	none	200	675	675	200	none	.....	.....
Xenia	203	1	141	1,901	220	3	6	4-8	none
Oklahoma:									
Altus	85	.....	21	310	300	none	7	1-6	none
Bartlesville	96	1	150	1,900	950	none	25	2	none
Durant	138	2	78	1,150	550	none	6	4	none
Hugo	140	.....	160	1,500	600	none	5	2.5	4
Mangum	81	none	28	640	380	none	none	.....	.....
Muskogee	620	none	456	5,150	4,800	none	14	4-6	none
Perry	52	none	8	200	150	.....	3	3	Keystone
Sulphur	59	none	15	500	6	none	6	2	Keystone
Oregon:									
Albany	54	.....	145	1,720	.....	.....	.....	.....	.....
Corvallis	103	2	238	1,975	1,975	.....	none	.....	.....
Grant Pass	48	9	.....	1,064	740	none	4	4	none
Hood River	53	4	165	600	10	.....	8	2	none
Klamath Falls	110	4	300	1,000	200	6	60	2	none
La Grande	146	.....	220	1,730	1,650	4	10	2-4	none
Marshfield	59	.....	.....	1,500	70	none	5	2-6	none
Medford	289	.....	.....	2,300	100	.....	.....	.....	.....
Portland	5,138	.....	7,319	61,451	16,986	.....	.....	.....	.....
Pennsylvania:									
Ashland	84	none	75	1,246	56	1	5	2	none
Barnesboro	27	none	19	.....	11	3	6	1½-2½	none
Bridgeport	45	.....	37	.....	87	.....	.....	.....	.....
Carbondale	130	.....	500	4,200	130	20	15	2-8	.....
Catasauqua	70	none	70	800	8	20	8	3-6	none
Chambersburg	153	none	260	2,760	1,162	.....	.....	.....	.....
Duquesne	144	none	140	1,800	1,850	none	10	4	none
Easton	212	none	.....	4,000	627	.....	40	4-6	Detector
Elizabethtown	46	none	25	530	427	.....	.....	1-6	Crown
Emporium	40	none	64	600	20	none	2	¾-4	none
Ford City	61	.....	42	878	877	.....	1	3	none
Franklin	85	.....	100	3,000	85	.....	3	8	none
Gettysburg	51	.....	.....	800	80	1	3	2-6	.....
Greensburg	284	.....	900	7,300	8,000	1	20	2-6	Hersey
Hanover	65	.....	75	1,200	.....	.....	.....	6-8	.....
Hollidaysburg	125	.....	390	3,080	120	.....	19	4-6	Hersey
Indiana	83	.....	150	1,400	870	1	9	4	none
Jersey Shore	88	.....	87	1,300	25	5	1	8	none
Juniata	90	.....	100	1,600	4	.....	.....	¾	.....
Kane	70	2	160	1,350	1,020	.....	16	4	none
Lancaster	714	.....	1,157	12,500	6,000	2	27	4-10	By-pass
Lebanon	224	.....	661	5,100	112	.....	15	4-6	none
Lehighton	65	10	85	1,192	19	20	2	4	none
Lewistown	155	.....	.....	3,548	74	.....	60	4-6	none
McDonald	45	.....	57	628	623	.....	2	4	none
Medville	217	3	338	3,200	3,207	4	8	2-6	none
Media	75	.....	110	1,200	32	.....	.....	.....	.....
Meyersdale	35	.....	40	800	20	1	.....	.....	.....
Minersville	50	.....	90	2,400	40	.....	1	4	none
New Kensington	144	.....	.....	3,300	3,000	.....	30	4-8	Hersey
Norristown	398	.....	405	6,000	480	2	12	4-6	Hersey
Oil City	311	.....	348	3,344	4,486	14	8	¾-4	none
Reading	1,022	.....	3,107	23,606	7,499	1,482	.....	2-8	Current, Hersey and
Shamokin	124	.....	476	5,537	75	78	4	4-6	By-Pass.
Steelton	125	.....	350	1,900	1,875	.....	2	6	none

For footnotes see page 632.

TABLE NO. 3—CONNECTIONS AND APPURTENANCES—Continued.

Private Fire Connections									
Fire hydrants	For filling watering carts	Gate valves	connections	Meters	Motors and elevators supplied	Number	Size of taps	Kind of meter	
Pennsylvania (Cont.):									
Titusville	165		250	2,700	86	12	4	none	
Towanda	67		60	1,100	32	8	4-8	none	
Wellsboro	79		57	700	30	3	1-6	none	
Wilkesburg ¹⁰	705	25	2,624	15,716	14,593	12	2-12	Hersey	
Rhode Island:									
Providence	2,664	91	5,177	32,115	29,918	224		Hersey	
Westerly	222		285	2,332	2,123	12	4-6	none	
Woonsocket	739	60	868	4,125	3,967	19	81	4-10	Hersey
South Carolina:									
Abbeville	72		26	487	474	2	6	none	
Anderson	218	30		1,500	1,500	10	2-6	none	
Beaufort	30	2	12	200	12	4	3-4	none	
Bennettsville	73	4	65	400	385	4	1½-2	none	
Charleston	630		475	6,500	4,000	10	6	none	
Cheraw	38	1	48	150	150	5	2-6	Eureka	
Clinton	65	1	42	320	320	43	2	6	none
Florence	145	4	118	1,305	900	2	6	none	
Georgetown	75		30	550	300	2	6	Keystone	
Union	85	2	124	852	852	5	3	6	Hersey
South Dakota:									
Aberdeen	172		247	2,600	1,700	4	6	none	
Brookings	102		77	412	441	1	3	Empire	
Rapid City	85	1	125	850	650			none	
Watertown	138		78	1,510	1,510	7	4-8	none	
Tennessee:									
Cleveland	71	1	75	1,050	800	5	6	none	
Dyersburg	100		104	960	52	7	2-8	none	
Fayetteville	62		28	750	38	none		none	
Franklin	63	1	44	500	500	2	2	none	
Greenville	56		38	507	40	3	5	2	none
Humboldt	20	2	11	620	42	1	2	none	
Jackson	306	1	450	4,600	98	12	6	none	
La Follette	30		24	927	52	2	none	none	
Tullahoma	71		45	460	45	6	4-6	none	
Union City	85	1	24	1,040	2	5	2-4	none	
Texas:									
Austin	625		300	6,070	6,070	8	2-4	Pitts. & Lambert	
Brownsville	82	6	33	800	800	6	2-3	none	
Dublin	36	1	23	400	300	3	2-4	none	
Ennis	91	3	64	800	173			none	
Galveston	703	18	120	8,179	7,750	100	4-6	none	
Longview	50		10	450	420	5	2	Empire & Nash	
Mt. Pleasant	50	2	15	350	350			none	
Nacogdoches	75	10	50	625	615	5-6	5	¾-2	none
Plainview	62	3	25	325	320	1	3	2	none
Quanah	100				250			none	
Stamford	35	1	40	800	600			none	
Sweetwater	200		25	600	590	4	4	Compound	
Vernon	52	2	101	500	200			none	
Utah:									
Lehi	40		190	350		20		none	
Salt Lake City	2,212		3,786	24,612	4,914	151	1-6	Several kinds	
Vermont:									
Barre	138	8	332	1,367	452			none	
Burlington	259	30	731	4,221	3,798	30	3	none	
Essex Junction	33			450	200		1	none	
Fairhaven	42	2	47	500	7			none	
Newport	70	5	75	750		2	4-6	none	
Northfield	83	2	114	345	230	2	3-6	none	
Richford	49	6	50	350	10	1	2	4	Neptune
St. Albans	117	7	164	1,400	1,350	4	4-6	none	
Virginia:									
Charlottesville	95	3	138	2,209	1,216	12	2	none	
Danville	202		347	4,075	4,112	4	40	4-8	none
Marion	60		30	600	2	2	4-6	none	
Martinsville	47		15	700	325	2	4	none	
Radford	65		150	600		2	8-10	none	
Richmond	1,720			33,591	26,049	183	2-8	20	
Washington:									
Auburn	68		80	723	40	1	4	none	
Bellingham	287	35		5,476	1,290	6	50	5½	21
Blaine	22		57	485	57			6	Empire & Hersey
Centralia	87		250	1,800	170		20	2	none
Chehalis	106		130	940	95	2	9	2-6	none
Cheney	40		20	300	300		1	2	none
Edmonds	24		30	375			3	2½	none
Ellensburg	118	10		675	76		2	2½	none
Goldbar	7	2	4	64					none
Hoquiam	130			2,160	569	1		2-8	none
Montesano	43			425					none
Olympia	120		157	1,350	750		5	4-6	none
Palouse	26		11	350	300				none
Pe Ell	10		25	150		3	10	4	none
Port Townsend	65	1	82	742	28	1	4	1½-2½	none
Pullman	64	1	90	868	861		3	2	Keystone
Seattle	5,867		5,652	44,000	42,004	91	207	2-6	Underwriters Valve
Snohomish	102		125	1,000	7	2	6	2	none
Tolt	15		8	174		3	3	2	none
Walla Walla	300	102	524	3,961	789	3	10	1½-4	none
Winlock	20	1	26	215	93		5	2	none
West Virginia:									
Fairmont	241		1,451	5,112	814	3	14	2½-6	Velocity-Detector & Comp.
Martinsburg			180		130	4	4	6	none
Piedmont	34		50	600	none	6	7	1½	none
Princeton	36			898	764				none
Sistersville	75			1,125	24	2	none		none
Wisconsin:									
Baraboo	150		40	1,200	750		2	3	none
Beaver Dam	154		95	1,350	425		6	6	none
Columbus	55		62	500	463				none
Eau Claire	482		259	3,349	2,430		7	4-6	none
Fond du Lac	271			3,900	3,150		9	4-8	none
Green Bay	490		436	5,054	5,054		12	2-6	none
Janesville	312	4		3,150	1,250	1	15	2-6	none
Kaukauna	103	5	79	775	328		5	6-8	none
Kenosha	364	11	440	4,500	4,000		18	4-8	none
Lake Geneva	81		29	440	425		5	4	Worth. & Neptune
Lancaster	86			654	56				none

For footnotes see page 632.

TABLE NO. 3—CONNECTIONS AND APPURTENANCES—Continued.

	Fire hydrants	For filling watering carts	Gate valves	connections	Meters	Motors and elevators supplied	Private Fire Connections		
							Number	Size of taps	Kind of meter
Milwaukee	3,681	.....	4,286	83,408	63,277	201	189	4-6	none
New London	63	6	40	450	320	2	.....	.....	.....
Oconomowoc	76	.....	106	627	483	2	.....	.....	none
Oshkosh	496	.....	348	4,835	1,649	.....	20	2-8	none
Pt. Washington	72	.....	53	619	565	3	3	.....	none
Rhineland	159	.....	120	971	3	1	none	.....	.....
Richland Center	81	.....	62	736	625	.....	1	4	none
South Milwaukee	140	.....	52	790	790	.....	5	6	various
Sparta	86	.....	80	725	610	2	none	.....	.....
Watertown	194	.....	184	1,500	1,410	6	13	4-6	none
Waukesha	275	.....	225	2,250	2,250	.....	5	6	.....
Waupaca	80	3	63	622	87	.....	.....	.....	.....
West Bend	77	.....	62	477	475	.....	.....	.....	.....
Wyoming:									
Cheyenne	275	3	200	2,500	50	.....	17	1	none
Green River	21	.....	50	175	5	.....	.....	.....	.....
Rock Springs	58	2	116	1,200	950	.....	4	2	none
Sheridan	152	.....	174	1,826	7	.....	3	2	.....
Canada:									
Brantford	331	62	561	6,918	1,976	16	42	4-8	Protectus
Toronto	6,440	.....	6,161	102,879	3,499	.....	573	.....	none
Winnipeg	2,355	.....	3,990	34,163	31,514	.....	193	2	none

METERING IN WALTHAM

Introduction of Meters Removed Necessity for Decreasing Supply at a Cost Much Greater Than That of Metering—Other Advantages.

By BERTRAM BREWER.*

In 1906, in Waltham, Massachusetts, there were three hundred and twenty, or 9 per cent of the services metered. Thereafter for about seven years the percentage of metered services was not materially increased. Six years later, in 1912, the percentage of metered services had been increased to but 17 per cent. Meanwhile the consumption of water, which was already high for a small city of 30,000 inhabitants, grew apace, mounting from 83 to 98 gallons per capita. About this time intelligent metering was begun in earnest and 4000 meters have since been added annually, with the result that the consumption has as steadily decreased, running from 98, 90, 82, 74.5 to 72 gallons per capita during the year just past. Fifty-three per cent of the services are now metered and the rate of consumption is reduced to a fair amount. The actual figures for the years mentioned are as follows:

YEAR	Number of Services	Metered Services Number	Consumption Average Gallons Per Cent.	per Capita.
1897 to 1906, inclusive	3710	320	8.6	83
1907	3740	320	8.5	80
1908	3800	320	8.4	82
1909	3828	452	11.8	83
1910	3891	632	16.2	88
1911	3959	682	17.2	98
1912	4044	1034	25.6	90
1913	4115	1426	34.7	82
1914	4224	1826	43.2	74.5
1915	4288	2299	53.6	72.1

No detailed records of cost of installation were kept in the department until early in 1915, when the writer took charge, and then the methods of procedure were found to be so radical and unsatisfactory to the consumers that very little meter setting was done until late in that year. By that time a cost-keeping system was inaugurated and a method of instructing each consumer and helping him to understand the new service was planned out and put into effect. Since then about 900 meters have been set. In the fall and winter of 1915 and '16 the five-eighths inch meters cost in place about \$8.40 each. Later, when prices began to rise, they cost about \$9.90; and so far this current year about \$11.50 each. Metering the whole system will cost about \$45,000.

The clerical work in a water department where bills

*Superintendent of Water Works and Sewers and City Engineer.

are issued quarterly is considerably greater and more difficult where meters are used than where semi-annual bills were rendered—perhaps double the work. The campaign of education which any right method of procedure entails is expensive and requires tact, good judgment and initiative, and one must have good nerves and be willing to work. Nevertheless, when a city with a limited supply of good water can not only check an alarming increase in consumption but, by the addition of 36 per cent more meters, can reduce that consumption to such an extent that the average pumpage is back to where it was ten years ago, the balance on the credit side of the ledger is overwhelming. The saving in expense for new works in this particular case is difficult to estimate accurately. There can be no doubt, however, that it would more than equal the \$45,000 it will cost to meter all the services. The collecting well and pumping plant for the last million gallons daily added to the supply cost about \$100,000. We do not know what the next million will cost, but we do know that in the last year meters have reduced the consumption by three-quarters of a million daily and at that rate a \$75,000 capital expenditure has been actually saved. This would leave a balance of \$30,000 over what it will cost to meter the whole city. The average cost of delivering water into the reservoir is about \$16 per million gallons. At that rate the saving in pumping during 1916 has amounted to \$4,380. This has much more than taken care of the additional maintenance expense for metered service. In Waltham the sewage is pumped twice before disposal into the sea, so that the cost of pumping wasted water after it reaches the sewers is again an item of expense.

Metering is the only way to make people really realize that they are wasting water. It places the responsibility on each consumer to do his share to make the co-operative business venture of supplying water a financial success and so secure to him the lower rate which he is constantly demanding. The insignificant little machine which goes into the humblest corner in the bottom of the cellar is really a great instrument for instructing the people in a wonderful partnership of co-operative conservation.

IDAHO TAXES MOTOR CARS BY WEIGHT.

The Idaho legislature, at the last session, passed a law requiring licensing of automobiles according to weight, as follows: For 2,000 pounds or less, \$15; between 2,000 and 3,000 pounds, \$20; between 3,000 and 4,000 pounds, \$30; above 4,000 pounds, \$40.

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THE AMERICAN WATER WORKS CONVENTION.

Someone has said that an engineer is one who can do with \$1 what any fool can do with \$2. The same definition might apply to a man skilled in any similar branch of work; and engineers and superintendents of water works would certainly seem to come within this category. The more skilful and expert in work of this class a man may be, the greater generally will be his saving, or, what amounts to the same thing, the greater will be the result which he will obtain for the \$1 expended.

If there has ever been a time when the obtaining of the desired results with an expenditure of only \$1 instead of \$2 was necessary, that time would seem to be at hand. Material used by water works departments has doubled in cost within the past few months, and labor demands higher wages and is difficult to obtain at that. It therefore behooves every water works official to exercise more than ever his expert knowledge and resourcefulness in securing necessary results at a minimum cost.

Next week the annual convention of the national organization of water works men is to meet at Richmond, Va., and, considering the importance which this subject of efficiency with economy has assumed in the affairs of most of them, it is very probable that the subject will be discussed there. But even though it may not be, no water works superintendent or engineer can afford at this time to neglect any opportunity which may present itself to add to his knowledge in order that he may more nearly meet the definition referred to; and we do not know of any way in which an equal addition to information along this line can be acquired more quickly and more reliable in its nature than that secured by attending one of these conventions and mingling there with the leaders in this field.

Every year should find the convention of this society attended by all those interested in water works who can possibly get there, but the difficulties at present confront-

ing such officials and already alluded to would seem to make this more desirable this year than ever before, and we hope that the Richmond convention will find more water works men gathered for mutual instruction and enlightenment than has any preceding one.

WATER WORKS AND CITY PLANNING.

At the next annual convention of the American Water Works Association, an exhibit will be made by the city planning committee of that association showing photographs and other reproductions of water works structures which are considered as either admirable or horrible examples of the effect produced by such structures from an artistic point of view. This is a matter which has too often been overlooked by water works men, and especially those designing the more prominent above-surface features of a water works system. Efficiency, economy and durability have been the chief ends toward which water works designers have been striving for years, but they apparently are now waking to the importance of considering as well the effect of these structures upon the appearance of their city. As a further inducement to those who still consider the matter one of minor importance, attention may be called to the fact that it has its practical side. The writer can recall one instance in which the trimming up and sodding of reservoir banks and the constructing of an artistic brick pumping station actually added to the market value of real estate in the vicinity enough to more than pay the entire cost of the improvement.

The features that will most readily occur as those to which this principle should be applied are pumping stations, reservoirs and standpipes. In case of reservoirs, giving a uniform and rather flat slope to the outside of the embankment (the idea of the flatness being to permit the retention and frequent mowing of the sod placed thereon), the sodding of such bank and possibly the planting of hedges or shrubbery at the foot of the same, and a little attention to keeping both grass and shrubbery trimmed and in neat condition, will involve little expense, especially if the grading and sodding be done during the original construction, and will add greatly to the appearance of the reservoir. Add to this a flight of substantial steps leading to the top and a hedge or iron fence to prevent the wearing of paths up the bank at other points, and the placing of a neat iron or wire fence around the reservoir and the construction of a gravel or concrete path around the top of the embankment, and we have supplied many of the features of an open park and certainly added to the attractiveness of the property. A superintendent who has his pride stimulated can, with a little effort and practically no labor except that furnished by the spare time of some of the outdoor gang, add additional decorative features in the form of flower beds or other ornamental vegetation.

In the case of pumping stations it is extremely desirable that the exterior be planned by an architect, the designing engineer, of course, determining the dimensions and height necessary. The construction need not be expensive in order to be artistic, and the only additional cost might be the fee of the architect for making the plans. Of course, the changing from a timber frame work sheathed with corrugated iron to a brick building roofed with slate adds considerable expense in addition to that of the design; but the former construction is one which should not be tolerated anywhere within the limits of a city, and one which in the end is likely to prove expensive, if intended to be permanent, because of its rapid deterioration. Where possible (as it usually is) it is desirable to have the pumping station sur-

rounded by more or less open land, and this should be carefully laid out in convenient walks and drives, the latter required for the bringing of coal and removal of ashes in steam plants, and for vehicles used for bringing and removing machinery, repair parts, etc., in any case. Here, also, a little pains taken in the planting of shrubbery and flower beds is greatly to be desired and should be considered as a duty to the taxpayers and other citizens, especially when the pumping station is in or near the residential section. Where the station is along a river bank, an excellent opportunity is generally offered for landscape architecture, having as its background a body of water, which always adds an attractive feature to landscape work.

The most difficult of the three principal above-ground structures referred to is the standpipe. A steel standpipe at best is a blot on the landscape, and at worst its effect may be beyond description. Probably the best that can be done is to render it as inconspicuous as possible, and in this we may take a lesson from the navy and paint it a dark or slate gray, drab or olive green or some similar color which blends in with almost any background. An elevated tank can be made less objectionable and even be given a certain grace of its own by care in designing the tower which supports it, probably the best result being obtained by giving a flare or bell-shaped form to the bottom of the structure, although this should not be overdone. In neither tank nor standpipe should there be any attempt at ornamentation, since in no other structure, possibly, is it more true that features which plainly indicate that they are not essential to the structure are not ornamental but only ridiculous. If a standpipe is necessarily placed where it can not but be a prominent feature of the landscape, it is possible to render it almost attractive by inclosing it in a masonry structure, but this should be carefully designed by an architect to produce the desired effect. Simply inclosing a steel standpipe by a cylinder of concrete is only increasing the size of the object without bettering its appearance; especially if, as is likely to be the case, the surface of the concrete is more or less mottled or blotched in appearance and shows the crease marks of the forms used in its construction. Brick and stone seem to offer the most favorable opportunities for making a picturesque structure to inclose a standpipe, several illustrations of which may be found in different cities of the country.

Similar care and thought should be taken to secure attractive appearance in other above-ground structures and areas, such as those connected with purification plants, land devoted to the wells from which the water supply is drawn and, in fact, any area owned and maintained by the water department. In many cases such area offers an excellent opportunity for the development of a public park or playground, since the land is already owned and attention of some kind must be given to it, while its use by the public as a pleasure or recreation park can be secured at much less cost on this area than on one especially purchased for the purpose.

SAN DIEGO'S PIPE YARD.

In the early part of this year \$2,000 was appropriated to permit the Operating Department of San Diego, Cal., to build a warehouse for the Purchasing Bureau, with which funds were built a large warehouse, 40 x 70; a smaller one, 30 x 42; a storeroom for machinery, 18 x 144, and a pipe shed, 20 x 72. These were all located at the water works pipe yards. A lifting device was installed to be used in

connection with the dipping tank maintained at this yard, where all cast iron pipe is dipped with an asphalt mixture before being placed in stock. Many lengths of second-hand pipe are made as good as new by cleaning and dipping them; and many dollars of the city's funds are saved at this yard by collecting other unused city property, putting it into condition to be used and storing it until needed.

WATER FILTRATION IN THE UNITED STATES AND CANADA.

The table given herewith shows the number of water filtration plants in the United States and Canada, the population supplied from such plants and their total filter capacity. This information was compiled by Burns & McDonnell, consulting engineers of Kansas City. In sending this, Mr. McDonnell states that in 1900 less than two million people were using filtered water; in 1910 approximately ten million were so supplied, while at present about twenty million are using filtered water. The number of cities using such water in 1900 was fifty, and at present there are 781.

Along with the growth of filtration systems there has been a marked improvement in the design and economy of operation. For example, in 1900 this engineering firm felt that it was getting fairly good results when it obtained an average bacterial removal of 96%, while now less than 99% is looked upon with some suspicion. Also in the older plants it was not unusual to use as high as 6% of the filtered water for cleaning the filters, while with the most modern methods in use this seldom exceeds one per cent.

Water Filtration in the United States and Canada in 1916.

States.	Municipal owned	Private owned	U.S. owned	Total plants	Population covered	Total filter capacity
Alabama	6	5	..	11	250,000	27,000,000
Arizona .....	..	1	..	1	3,000	300,000
Arkansas	3	6	..	9	103,000	14,100,000
California	5	12	1	18	1,168,000	96,463,000
Dist. Columbia ..	1	..	..	1	353,000	75,000,000
Colorado	6	3	..	9	271,000	62,475,000
Connecticut	3	3	..	6	175,000	31,000,000
Delaware	1	..	..	1	92,000	24,000,000
Florida	1	..	..	1	3,000	..
Georgia	26	2	..	28	345,000	64,350,000
Iowa	11	10	..	21	276,000	53,700,000
Indiana	5	14	..	19	553,000	92,950,000
Illinois	15	21	2	38	481,000	112,050,000
Kansas	29	4	1	34	218,000	42,726,000
Kentucky	7	11	..	18	379,000	108,750,000
Louisiana	3	1	..	4	406,000	52,500,000
Maine	2	8	..	10	86,000	22,550,000
Maryland	5	5	..	10	631,000	141,850,000
Massachusetts ..	10	2	..	12	368,000	44,800,000
Michigan	4	5	..	9	235,000	54,410,000
Minnesota	8	3	..	11	380,000	62,928,000
Missouri	16	15	..	31	1,021,000	203,432,400
Mississippi	4	1	..	5	83,000	14,300,000
Montana	6	..	..	6	35,000	22,800,000
Nebraska	1	1	..	2	6,000	600,000
New Jersey	13	19	..	32	330,000	165,104,000
New York	41	20	2	63	2,859,000	198,194,000
New Hampshire ..	2	4	..	6	51,000	6,614,000
New Mexico	2	1	..	3	6,000	1,500,000
No. Carolina	32	7	1	40	315,000	47,455,000
North Dakota ..	6	..	..	6	42,000	8,836,000
Ohio	40	10	..	50	2,025,000	510,055,000
Oklahoma	26	..	..	26	266,000	45,720,000
Oregon	5	5	..	10	22,000	12,618,000
Pennsylvania ..	19	80	..	99	3,436,000	860,361,000
Rhode Island ..	1	9	..	10	316,000	33,000,000
So. Carolina	9	6	..	15	172,000	27,400,000
South Dakota ..	1	2	..	3	24,000	1,850,000
Tennessee	5	3	..	8	125,000	23,500,000
Texas	16	3	..	19	378,000	42,130,000
Vermont	1	2	..	3	30,000	4,570,000
Virginia	7	6	1	14	205,000	29,150,000
Washington ..	2	..	..	2	8,000	1,500,000
W. Virginia	7	6	..	13	122,000	25,000,000
Wisconsin	6	5	..	11	176,000	38,950,000
Wyoming	3	1	..	4	12,000	6,115,000
Alberta, Can.	3	..	..	3	62,000	12,000,000
Manitoba, Can. ...	1	2	..	3	16,000	4,350,000
New Brunswick ..	1	..	..	1	7,000	2,000,000
Saskatchewan ..	4	..	..	4	40,000	10,400,000
Quebec	10	7	..	17	539,000	166,250,000
Totals	443	330	8	781	19,545,000	3,659,771,000

The WEEK'S NEWS

Road Progress and Legislation in Rhode Island, New York, Oregon, Ohio, New Jersey and Iowa—New Jersey's State Health Department—Standard Milk Grading—Baltimore's Watershed Forests—Buffalo to Double Meter Rates—The Indianapolis Water Rate Case—The Waterworks of Newark, Canton and Ogden—Decision in Kansas Natural Gas Case—Fire and Police Departments of Columbus—Newark Has Two-Platoon System—St. Louis Plans \$62,000,000 Improvements—Districting Permitted in Iowa Cities—Installation of City Weights and Measures Departments.

ROADS AND PAVEMENTS

Convict Road Labor for Rhode Island.

Providence, R. I.—Relief is expected for the shortage of labor on state highways, the state having been given permission by new legislation to use convict labor on the construction, repair and maintenance of the state highways. The prisoners will be paid the regular market price of labor, the state receiving of those wages the cost of keeping the prisoners and the balance going to the family of the prisoner himself. The bill provides that the Board of Roads may ask for convicts and the Penal Commission is authorized to detail convicts for the work.

Road Widths in New York.

Albany, N. Y.—Most of the roads built in New York by the state are 16 feet wide. When money was voted for the highway system it was on the basis of approximately \$13,000 per mile. This was in 1912, and \$13,000 was a low figure even for that date. Under present conditions it is obviously impossible to complete the system as planned then, and extra width is a serious expense. H. Eltinge Breed, first deputy highway commissioner of New York, states that only by the strictest economy, by substituting different classes of pavement within certain limits of cost, and by using federal aid, will it be practicable to have all the important roads brought together into a good highway system. It would be far better, he says, if there were sufficient funds to build them 18 feet wide for two lines of traffic and 24 feet for three lines. The use of motor vehicles is steadily increasing and they are being constructed wider. Hence they require pavements where vehicles at least 90 inches wide can pass one another comfortably and frequently. Eighteen feet is probably the narrowest width that permits this, according to Mr. Breed. Especially is this true, he says, in the case of concrete roads, because the transition from the hard concrete surface to the earth shoulder and back again becomes really dangerous in some soils on account of the rut that traffic usually wears along the joining line.

B'g Road Bond Election Law Defective.

Salem, Ore.—A special session of the state legislature may have to be called for the purpose of curing defects in the bill providing for a special election on state measures, including the \$6,000,000 bond issue for state highways, according to a statement by state senator A. W. Orton, the sponsor of the bill providing for the special election. He explained to city council that no provision had been made in the legislative bill for dividing the expense of the municipal and special state election to be held the same day between the city and county, and that because of this mistake, double pay will have to be given election officials. He said the special session of the legislature will cost less than the duplication of pay for election officials, amounting to about \$11,000.

Gold Beach, Ore.—The county court of Curry County has refused to provide for holding the special election in this county on June 4 for the purpose of voting on the \$6,000,000 bond issue and other measures to be considered at that time. The court holds that the bill providing for the big bond issue, and that for the election called for June 4 are both illegal and that the county cannot be compelled to hold the election. The order of the court says: "In the matter of the proposed special election provided

by the legislature to be held June 4, 1917, no appropriation for the expense of such special election having been provided for in the budget for 1917, and no provision being made in the proposed bond issue for the improvement of roads in Curry County; and, believing said election to be illegally called and of no benefit to Curry County, notice is hereby given that this court will refuse to authorize the holding of such election in Curry County or to pay any expense incurred by reason of such election, and the clerk is hereby instructed to refrain from taking any steps toward holding such proposed election." It is claimed that under the provisions of the bond issue the \$6,000,000 must be expended upon hard-surfacing the roads designated, and in preparing roads in the several specially favored counties for paving, and that Curry County has been totally ignored and, therefore, the bond issue would in no way benefit Curry County. Even should no election be held in the county and an election be held in the remainder of the counties, the election in the state would probably not be invalidated, as some attorneys hold, while others disagree with this view. Should an elector bring mandamus proceedings, he would have to institute it either through the district attorney or the attorney general, it was declared. As mandamus proceedings can be brought in the first instance in the supreme court, the decision could easily be procured before the date of the election, it was stated.

Printer's Error May Invalidate Road Law.

Columbus, O.—A printer's blunder has damaged and may have wiped out the Ohio highway department. The error was discovered by attorneys for the Good Roads Federation and information was laid at once before Governor Cox. It will require a suit in the supreme court to determine if there is anything left of the highway laws. The blunder consists of substituting the title of the bill for the enacting clause in the enrolled bill, the copy signed by the officials of the house and senate and sent to the governor.

Begin Fight Against Edge Road Tax.

Trenton, N. J.—Representatives of municipalities and civic organizations, who took part in the conference in Newark to plan for proposed litigation to oppose enforcement of the state road tax law, have advanced their work to the stage where they are ready to engage the lawyer who is to conduct the battle. As to raising funds for the battle, it was decided that each municipality taking part in the contest would be assessed for a share of the expense proportioned on the basis of tax ratables. The people of Passaic, said mayor Seger, of that city, are opposed to the law because "they cannot stand the extra burden, and the tax is absolutely inequitable." Controller Collins, of Elizabeth, said the council and mayor of his city were ready to provide for an appropriation to contest the act. Representatives of municipalities in Hudson, Union and Passaic counties, as well as Essex, were present. Discussion centered on the possible legal weaknesses of the law, covering not only the act itself, but the exemption of tax on bank stock and the supposed irregularity in the scheme of taxing the railroads. Meanwhile advice was sought from the attorney general as to whether funds of the road department now available or becoming available with the opening of the fiscal year can be devoted to the construction of new roads, or whether such construction must await the receipt of revenues under the new Edge road tax act. Attorney general Westcott holds that it will be entirely legal to use receipts from the motor vehicle department for new con-

struction, thus diverting the money temporarily from repair work. The plans of the state highway department have been somewhat upset by the appointment of General Goethals by President Wilson to take charge of shipbuilding. On the recommendation of General Goethals, the state highway commission named W. G. Thompson, one of his Panama Canal engineers, as assistant highway commissioner of New Jersey. Thompson had charge of concrete work and road construction at the Isthmus. His pay of \$4,000 now, will be increased to \$5,000 when the highway building is started, the pay being equivalent to that formerly paid the New Jersey commissioner of roads. Robert A. Meeker will be the engineer and his salary has been advanced from \$4,000 to \$7,000. District engineers who are to be appointed will receive \$3,600.

Iowa Finally Gets Road Legislation.

Des Moines, Ia.—After months of political fighting and the introduction of many bills by all sides of the controversies, the governor has finally signed legislation determining the status of road-building in the state. The Foster bill went through the house despite numerous efforts to amend it. The measure requires a definite system of caring for the county road system. Under the bill the county boards of supervisors are required to hire road patrolmen, who shall devote all of their time during the road working season to caring for the maintenance of the highways. The supervisors are required to assign each man to a definite district, and he must visit each portion of the road in his district at least once a week. The working out of the plan is left largely in the hands of the supervisors, who are granted authority to fix compensation and determine the number of men required in each county. The road patrolmen are also assigned the duty of dragging the sections of road under their control, or of seeing that they are dragged. Township road systems are not affected by the bill.

The governor has also signed the Balkema bill accepting the provisions of the Shackleford act of congress, under which \$2,200,000 is granted to Iowa for expenditure in permanent improvement of post roads of the state. Provision is made for the expenditure of an equal sum from the state motor vehicle fund and other road funds to meet requirements of the federal act. The road question was the dominating issue during the early part of the session and was emphasized by the effort to abolish the state highway commission as embodied in the Pitt-Johnston bill. This was settled after a two days' deadlock, in which the Pitt-Johnston bill went down to defeat. The Chase bill, with a similar purpose, was also defeated. Another interesting measure signed by the governor is the Balkema joint resolution which provides for an investigation of the possibilities of the state of Iowa going into the manufacture of cement and to report back to the next general assembly. Other road legislation passed and signed by the governor includes the Nicholson bill authorizing payment for oiling roads out of motor vehicle fund; the Elwood bill, making the amount of the county road levy optional with board of supervisors at from one to two mills, and the Wenstrand bill repealing the law authorizing supervisors to establish consent highways at their discretion.

SEWERAGE AND SANITATION

Suggested Health Legislation in New Jersey.

Trenton, N. J.—The recently published annual report of the state department of health makes a number of recommendations for legislation necessary to increase the efficiency of public health activities in the state. The 1915 law reorganized the department, putting the work in charge of a director and an appointed bipartisan board of eight members. The detailing of duties resulted in the burdening of the board with a great deal of administrative routine which could be better handled by the director, if such an arrangement were permitted under the law. The department finds the present procedure for its control of local health boards too complex and hampering and urges that it be allowed in emergencies to take complete charge of a municipal

board, to require the members of such boards to carry out its orders, with the power of penalizing them upon refusal. The state department also desires power to remove a local health officer for cause, for incompetence or failure to perform his duty, after an adequate hearing. That the employees of the department be invested with the power and authority of constables is also urged. Standardization and simplification of procedure in the reporting of disease cases is needed. Vital statistics, in all cases, it is suggested, should be transferred to local boards of health, as also should such work as licensing and inspection of ice-cream factories, etc., which at present burden the state department with a number of really local duties. Requirement of annual permits to be issued by the state department to all establishments handling or producing food materials is urged. Other improvements asked deal with: Increased power of city water departments and companies to protect their supplies; permission for the state laboratory to make analyses, for fees, for private individuals; examination of food handlers; prohibition of preparations containing narcotics for infants.

Sewer System Bond Issue Defeated.

Aberdeen, S. D.—The proposition to bond the city for \$200,000 for constructing a storm water sewer system was defeated by a big majority of 753—1,155 against to 402 in favor. The city commissioners and city engineer Frank Le Cocq had asked the citizens for a favorable vote. "The city has never had a comprehensive system of taking care of surface water and it never will have if it continues as it has during the past," said the city engineer. The trunk sewer would have passed through practically the central part of the city and have been nine feet in diameter. The laterals would have taken care of the lowest areas of the city and provided drainage for the large amount of street pavements petitioned for. By the construction of the drainage system, the sanitary sewer system would have been relieved.

Standard Milk Grading for Small Municipalities.

New York, N. Y.—Standards and grades of milk practical for small cities and towns are for the first time advocated by the National Commission on Milk Standards in its third report just issued by the U. S. Public Health Service, Washington, D. C. The commission recognizes that no matter how good the general milk supply of a community is, it is not of a single standard of excellence, hence there are actually different grades of milk in every community, and the official recognition of such grades is always advantageous. Because of climate, size, nearness to sources of supply, easy transportation and the progress already made in improving the general milk supply throughout the country, and in educating the dairymen and the public, different communities are in a position to secure varying degrees of excellence in their standards for the grading of milk. Most communities, according to this authority, are now able to secure some high class milk, and the commission advocates that this milk shall bear a distinctive label, thus distinguishing it from milks of inferior quality and influencing the careless producer to raise the quality of his product. The fact that all communities have some good milk is due primarily to the very great co-operation on the part of the public press in educating the producer and the consumer as to the public health value of clean, safe milk. The commission urges that its standards for grades "A," "B" and "C" milk be regarded as minimum standards and that if local conditions permit a community should adopt higher requirements for its grades.

Whatever departures are made by any community from the exact definition of grades as recommended by this Commission, several fundamental principles are recognized by the Commission as of universal application, and from these there should be no variation. These fundamental principles are:

- (a) Grade A milk, in a general way, is milk which complies with requirements of such character and degree that, for all practical purposes, no real advantage would be gained by further and higher requirements. The standards for this grade should, therefore, be placed high enough to attain this end, but not so high as to limit too greatly the supply, or, through unduly raising the price to the consumer, to limit too greatly the demand.

- (b) Grade B milk is all the remaining milk of the community which is suitable for drinking purposes, after pasteurization, but which does not comply with the high requirements of Grade A milk.
- (c) Grade C milk is milk which falls below the minimum requirements for milk suitable for drinking purposes, even after pasteurization. Its use must be confined to cooking and manufacturing purposes. Recognition of this grade of milk is not recommended by this Commission except in communities in which such recognition is temporarily at least an economic necessity.

The detailed requirements of grades are published for general distribution. Besides standards and grades for milk, the commission also prescribes grades for cream, butter, ice cream, condensed milk, skim milk and buttermilk. The National Commission on Milk Standards was organized in 1910 by the New York Milk Committee, and while the commission has created and its expenses are borne by this committee, it has never been the intention that the commission have the New York City milk problem solely in mind, but rather that it should make recommendations regarding milk standards and legislation that might be adopted in any city or town in the United States or Canada. The commission has held eight meetings to date and its two previous reports have, as the present one, been published by the United States Government. This commission was the first representative expert and authoritative body in the United States to recommend comprehensive standards and grades for milk. All municipal and state regulations now in force have been based on the National Commission's reports of 1912 and 1913. The present report is a continuation and practical extension of the milk grading system that the commission has consistently followed since its organization by the New York Milk Committee in 1910. The New York Milk Committee is a voluntary organization, working for the improvement of the milk supply of New York City and the reduction of infant mortality. It selected the members of the National Commission on Milk Standards from a list of more than two hundred men of prominence in medicine, sanitation, public health and laboratory work who were recognized as authorities on the milk question. Prof. M. J. Rosenau is chairman and Dr. Charles E. North secretary of the commission. Of the men composing the commission there are eight public health officers, seven bacteriologists, three chemists and two agricultural experts; thirteen of the number have been educated as physicians; two of the members have had long practical experience in the milk industry, and six have been connected with the production and control of certified milk.

"Movies" in Big Health Campaign.

Minneapolis, Minn.—A vigorous health campaign, in which moving picture theater owners throughout the entire state will be asked to take part, is about to be launched following a conference between exhibitors and health experts. It is the plan to enlist every picture theater proprietor in the state in this "health betterment" campaign and slides and other advertising matter will be provided for exhibition and distribution in the theaters. Dr. A. J. Chesley of the state board of health and Dr. J. W. Bell of the Hennepin county sanatorium commission, Frank Bruno, secretary of the Associated Charities, are active in the work.

Health Department Fights Insanitary Tenements.

New Haven, Conn.—Tenement house inspector John J. O'Donnell estimates \$200,000 worth of improvements have been made in tenement houses that he has ordered put in condition to comply with the health laws. In all about 2,500 orders have been issued since the law went into effect. The right of inspector O'Donnell to order improvement of tenements has been questioned by attorney for a tenement house owner who was fined \$50 for not keeping tenements clean. The board of health will not stop its attempt to prosecute tenement house owners for insanitary premises, even should the decision of the common pleas court in this case, now pending, be decided adversely against the city's sanitary inspector. This much was determined at a meeting of the board when 25 cases were reported for action to the board by inspector O'Donnell and the entire board voted that the work recommended be ordered and if necessary the owners prosecuted.

WATER SUPPLY

Afforestation of Water Shed.

Baltimore, Md.—By extensive tree planting throughout the watershed areas, city forester R. Brooke Maxwell is improving the watershed at Loch Raven. A careful survey and mapping of the open lands at Loch Raven show a total of 1,175 acres of land to be put under forest cover. Of this amount 361 acres have been planted to date, with a setting of approximately twelve hundred trees to the acre. Since 1913, when this work was begun, the city forester's department has planted a total of 317,058 trees. During 1916 the number planted totaled 79,422. Various types of trees are being utilized for this work, the predominating kind being the white pine. During the past three years 185,125 specimens of this variety have been planted. Other species used and the numbers planted are as follows: tulip, 27,635; black cherry, 16,382; hard maple, 17,682; white ash, 27,209; Norway spruce, 1,076; pignut hickory, 4,578; red oak, 12,042; black locust, 13,852; catalpa, 10,152, and black walnut, 1,325. The water department provides annually a sum of money to carry on this work and it is proposed to proceed with the planting as fast as the fund will permit. The expense of this work has, by means of efficient methods, been kept down to a low figure. The planting of white pine transplants has been accomplished at a cost of \$15.00 per acre. The plans for the season's work, already begun, provide for the planting of about 75,000 young trees. For the purpose of reducing the cost of this work the water board has developed a small nursery at the Montebello filtration plant which is used to grow a part of the stock used in the planting work at Loch Raven. This nursery contains at this time about 60,000 plants.

To Increase Meter Rates.

Buffalo, N. Y.—By a vote of four to one the council adopted the recommendation of commissioner Arthur W. Kreinheder that the rate charged by the city for metered water be increased from two to four cents per 1,000 gallons. Mayor Fuhrmann cast his vote against the increase. Commissioner Charles B. Hill said that the increase was necessary to place the bureau on a self-sustaining basis and he added that if in the course of time the income of the water bureau should bring a profit the water rates could be reduced accordingly. The new rates are as follows: For the first 3,000 cubic feet or 22,500 gallons per month, 8 cents per one thousand gallons, or 6 cents per hundred cubic feet. From 3,000 cubic feet to 6,000 cubic feet, or 32,500 gallons to 45,000 gallons, 6 cents per thousand gallons, or 4½ cents per hundred cubic feet. Over 6,000 cubic feet or 45,000 gallons per month 4 cents per thousand gallons or 3 cents per hundred cubic feet. Commissioner Kreinheder announced to council that the deficit that it will face on June 30th, 1918, will be \$500,680.29. His communication stated that records of the department show the following facts:

1. That from June 30, 1912, to June 30, 1916, under normal conditions and with only one pumping station in operation the bureau shows by proper accounting a deficit of \$325,680.29, eliminating premiums and interest and bonds issued amounting to \$48,671.07, and grade crossing receipts for work done paid out of the bond issue amounting to \$36,299.57.
2. That the water sold during this time at two cents per thousand gallons metered was delivered at less than cost without deducting depreciation of plant and machinery, repairs, or renewals, or water waste.
3. That the cost to flat rate consumers and the cost to metered consumers for many years have not been properly proportioned.
4. That the payment from bond issues for all renewals, repairs, and reconstruction of water lines, without deduction for depreciation, as has been the practice heretofore, is poor business practice and deceiving in the figures covering the total value of plant and water bureau assets.
5. That the increased revenue from new customers each year is less than the increase in interest and sinking fund charges on bonded indebtedness, so that it shows that it is impossible under the present rates for the revenue ever to equal the expenditures or make up the deficit.
6. That the bureau of water can be made a self-sustaining department of the city government without making provision out of the general fund to care for operation and maintenance, or for the payment of bonds, heretofore issued or to be issued from time to time.
7. The real facts in connection with the bureau are: That prior to the commission form of government the bureau of water operating only one station for a period of five years shows a deficit of \$325,680.29 on cost of operation and maintenance alone and without deduction for depreciation, and in

many cases, capitalizing expense. That since the commission form of government operating two pumping stations, if the same method of accounting should be used, no deficit would occur. That the increased price of coal and other raw materials, approximately 100 per cent from May 1, 1917, will aggregate approximately \$175,000, so that the bureau will face a deficit by June 30, 1918, of approximately \$500,680.29. That to provide for the existing and oncoming deficit, and in order to place the bureau on a self-sustaining and sound business basis, deducting in the future a fair depreciation on plant, and making provisions for the retirement of bonds, the bureau of water be directed to meter all water consumption where water is used for other than household purposes.

Mayor Fuhrmann believes that the increase would have a harmful effect upon the industrial life of the city and would tend to scare away from the city industries which might be considering locating here. Henry B. Saunders, assistant secretary of the Chamber of Commerce, informed the council that the directors of the chamber had adopted a resolution favoring a raise from two cents per one thousand gallons to three cents, but did not approve of the increase to four cents. "It would be bad policy to increase the water rate," said Mayor Fuhrmann. "We are facing abnormal conditions at present. They will get better and I feel sure that the bureau of water will be making a profit within ten years. It is an asset of the city to have it known throughout the country that we are selling water lower than any other city."

Indianapolis Water Company Protests Decision.

Indianapolis, Ind.—The Indianapolis Water Company has filed a schedule of rates with the public service commission, in compliance with the recent order of the body establishing rates formerly agreed on by the water company and the city of Indianapolis, under the Bell-Geist rate contract. At the same time the company filed a protest with the commission against the rates, declaring that the order of the commission is invalid, "because it impairs the obligation of the company's contract secured to it by its charter and the ordinance of the city of Indianapolis of 1870, and deprives the company of the rights secured to it by said contract, takes its property without the process of law and denies to it the equal protection of the laws." The company has contended that the commission is without legal jurisdiction over its rates and the protest apparently signifies the company's intention later to go into court against the order, if the revenues from the new rates do not satisfy it. The protest continues, "The company herewith files its schedule of rates to be effective May 1, 1917. The action of the company in putting into force the rates set forth in said schedule is under protest and without waiving, but reserving all rights, so that a fair test of said rates in actual operation may be made to determine if they will bring a legally adequate return, and if by the order of the commission the obligation of said contract has been substantially impaired, or if the property of the company has been confiscated by deprivation of adequate revenues."

Emergency Disinfection of Water Supply.

Burlington, N. J.—The value of the portable disinfection apparatus recently acquired by the state department of health was shown when a breakdown at the Burlington water plant made it necessary to pump raw water into the mains for several days. Burlington has a rapid sand filter plant with hypochlorite disinfection, which, under normal conditions, effectively purifies the dangerously polluted Delaware River water. The law requires that whenever any accident happens at a water plant, which may result in lowering the sanitary quality of the water, the state department of health must immediately be notified by telegraph or telephone. This notification was promptly sent by the Burlington authorities when one of their raw water pumps broke down, throwing the filters and hypochlorite disinfection plant out of service, and one of the department's assistant sanitary engineers was immediately sent to Burlington with instructions to make all necessary arrangements to sterilize the water. A temporary hypochlorite disinfection apparatus which had been set up by the officials of this water company was not working satisfactorily, and the portable chlorine apparatus belonging to this department was sent to Burlington and put into operation not long after the breakdown occurred. Because

of the difficulty in getting parts for the broken engine, six days elapsed before normal pumping could be resumed. During all this time unfiltered water from the Delaware River was pumped more or less continuously into the mains, the only treatment which it received being the addition of chlorine at the rate of about 0.5 parts per million. When the breakdown first occurred the local board of health of Burlington immediately secured the co-operation of the boy scouts, who made a house to house canvass of the town, notifying every householder to boil the water. Undoubtedly this was done in many cases. This and the disinfection of the water by means of the emergency chlorine apparatus was probably sufficient to protect the citizens against the epidemic of typhoid fever which would almost certainly have resulted if the very dangerously polluted Delaware River water had been used in its raw state. Accidents like this occasionally happen to other water plants throughout the state, and the department is prepared at short notice to provide temporary facilities for disinfection when needed.

Earnings of Newark's Waterworks.

Newark, N. J.—Net earnings of the bureau of water of the Board of Works for 1916 were \$330,014.76, or practically an increase of 100 per cent over those of the previous year, which were \$167,549.43. This increase is accounted for largely by the greater amount of water used by factories in the war trade, particularly dyestuff and chemical plants. The figures are taken from a financial statement presented to the board by John W. Judson, chief accountant of the water bureau. The bureau's actual profits are more nearly stated, however, in the gross corporate income figure of \$1,025,191.91, out of which was paid \$145,597.15 on sinking fund and \$549,580 as interest on funded debt, leaving the net earnings as stated. In 1915 the gross corporate income was \$859,772.11, from which was paid \$147,078.10 on sinking fund and \$545,144.58 as interest on funded debt. The net sales of water in 1916 were \$1,504,176.19, whereas in 1915 they were \$1,325,982.91.

Canton's Waterworks Finances.

Canton, O.—The waterworks department at the close of 1916 showed a balance on hand of \$64,008.55, according to the annual report of waterworks secretary H. H. Heingartner. The total receipts in 1916 are given as \$245,905.77, and the total expenditures as \$181,897.22. The city's waterworks system is valued at \$1,162,275.25, not including \$11,343.44 in bills outstanding, \$10,682.91 of which is due from the schools for water rent. The city's water mains are valued at \$554,779, according to Heingartner's report. The office expense for 1916 is given as \$12,746, the pumping expense as \$28,321, and the pumping maintenance expense as \$7,772. The maintenance of the distribution system is put at \$12,475. Extraordinary expenditures are given as \$46,788, of which \$30,102 was expended for water mains. The bonded debt of the department on January 1 this year was \$522,900, it is stated. Mayor Stolberg has announced that there would be no increase in the water rates at this time, although auditor Barr figures the department will be about \$10,000 short at the end of the first half of the year. Stolberg points out that the department will have some expense the first half of the year that it will not have the last six months.

Gardens Make Big Demand on Waterworks.

Ogden, Utah—Under pressure of the general demand for free water for city gardens, to reduce the cost of living, commissioner Miles L. Jones, in charge of the water service, said: "We desire to make the rate as low as possible, allowing as much water for garden irrigation as may be consistent with public safety and domestic requirements, but the public must consider the fact that last year, without gardens, we had not an ounce of water to spare. Every well and valve was open to full capacity last year. Much water was wasted, of course, on the lawns, and this no longer will be allowed. If there are many gardens this year, we shall have to put restrictions on water for lawns. The gardens will be considered first, however, and the lawns of secondary importance. Nearly everyone who has a garden, also has a lawn. The maximum supply of water is 11 mil-

Pure Water Assured All Users of ROBERTS FILTERS

The Roberts System is adapted to filtration of water in any quantity. The smallest system merits our attention as well as the largest, guaranteeing to render any water (regardless of its turbidity) bright, clear and sparkling, and to remove 97% of bacteria—plants already installed have shown removal of more than 99%.



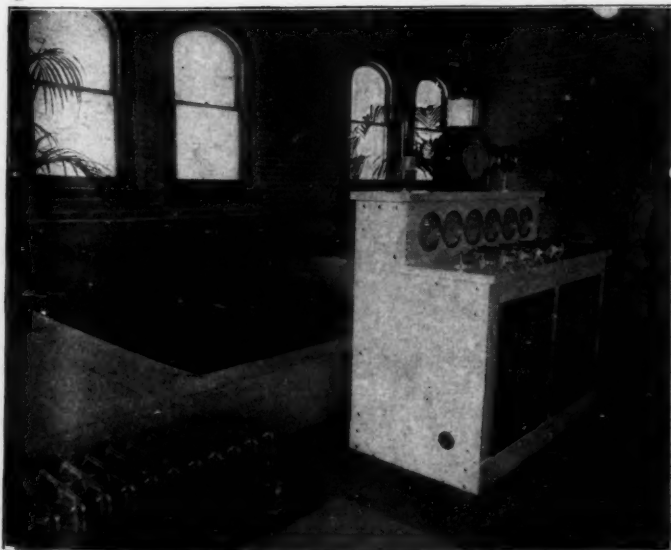
Indicating and Recording
Loss of Head Gauge

Filter plants installed or equipped:

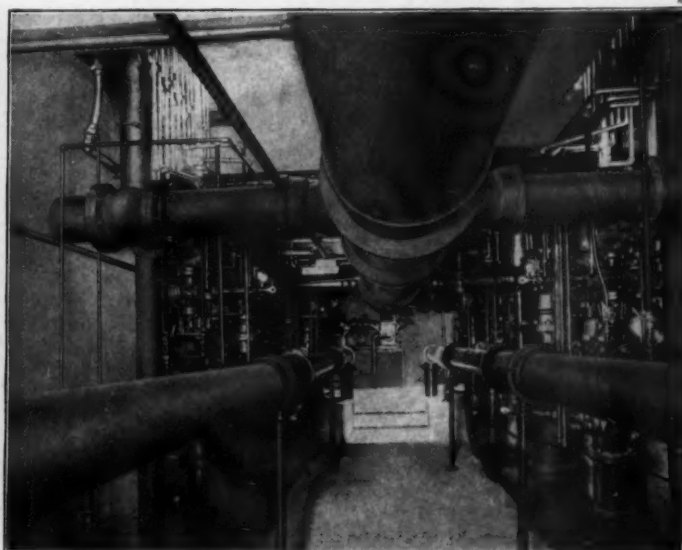
	Capacity, Gals.
Montreal, Canada...	55,000,000
New Orleans, La....	40,000,000
Trenton, N. J.....	30,000,000
Grand Rapids, Mich.	20,000,000
Oshkosh, Wis.....	6,000,000
Wilmington, Del....	12,000,000
Logansport, Ind....	8,000,000
Edmonton, Canada..	6,000,000
Saskatoon, Canada..	4,000,000
Algiers, La.....	4,000,000
St. Hyacinthe, Que.	
Canada	4,000,000

And 226 plants from 1,000,000 to 3,000,000 gallons capacity each.

We solicit your patronage and will make recommendations and estimates for your requirements.



Roberts' Standard Operating Table



Typical Pipe Gallery of Filtration Plant


Roberts Filter Manufacturing Co., Darby, Pa.

Your map is your

No wonder there are 1,150 miles of Cast Iron Pipe in Minneapolis!

Some time ago the Water Department of Minneapolis had occasion to examine Cast Iron Pipe that had been in the ground for 42 years. This examination proved the pipe to be in practically the same condition as when first laid.

No wonder Minneapolis is enthusiastic about Cast Iron Pipe! But the enthusiasm of this city is no longer that of a handful of citizens in which Cast Iron Pipe has given long years of perfect service.





"792 miles of Cast Iron Pipe here"

thereby adding another chapter to the long story of long service given in cities throughout the world by

Cast Iron Pipe

So, first of all, let us be clear about the pipe. It is not a pipe because it has given us that long service. It is a pipe because it has given us that long service. It is a pipe because it has given us that long service. It is a pipe because it has given us that long service.

The Cast Iron Pipe Publicity Bureau
New York

Cast Iron Pipe has given St. Louis two thousand miles of satisfaction

To be exact there are just 1987 miles of Cast Iron Pipe (water and gas) in that city.

And because frequent examinations have shown even the earliest installations to be in practically perfect condition.


St. Louis now reckons the life of Cast Iron Pipe at not less than 100 years.

It is not logical to select the pipe that is the standard of the city's largest cities?

It is not logical to select the pipe that is the standard of the city's largest cities?

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The Cast Iron Pipe Publicity Bureau
New York

New Orleans' corrosive soil holds no terrors for Cast Iron Pipe—



Pipe laid there in 1876 proved its remarkable durability, notwithstanding the very soft clay, the large amount of peat and vegetable matter in the soil, and the ineffective drainage system.

This good showing was responsible for New Orleans' selection of 570 additional miles of Cast Iron Pipe in 1916.

Another tribute to Cast Iron Pipe—another chapter in the long story of its universal satisfactory service.


The Cast Iron Pipe Publicity Bureau

1 Broadway
New York


Cast Iron Pipe has proved its merit

Salem has the longest continuous running Cast Iron Pipe section.



The Cast Iron Pipe Publicity Bureau

1 Broadway, New York



The Cast Iron Pipe

No. 1 Broadway

pipe buying guide

Chicago stands on 5,501 miles of Cast Iron Pipe

If any further evidence is needed to prove that Cast Iron Pipe is the most efficient and economical evidence, Chicago will furnish that.

Since 1857, about 5,501 miles of Cast Iron Water and Gas Pipe have been laid in the Windy City. Of this, more than 4,000 miles is still in excellent condition.

Very little deterioration has been observed, but has been attributed to the fact that the pipe is not subjected to the same wear and tear as other materials. The city officials are not prospective buyers of pipe, but are prospective buyers of pipe. The city officials are not prospective buyers of pipe, but are prospective buyers of pipe.

The Cast Iron Pipe Publicity Bureau
1 Broadway, New York

IN THE HUB there are more than 1937 miles of Cast Iron Pipe

The Cast Iron Pipe Publicity Bureau
1 Broadway, New York

6,645 Miles of Cast Iron Pipe in New York

Yet six thousand six hundred and forty-five miles of Cast Iron Water and Gas Pipe. And you've got it all in one hundred years. You old and young, think!

Cast Iron Pipe

The history of the new high-pressure water pipe, which is 12 inches in diameter, is a record for its strength. It is the strongest material ever made. It is the strongest material ever made. It is the strongest material ever made.

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Cast Iron Years of Service

The Cast Iron Pipe in New York City is a record for its strength. It is the strongest material ever made. It is the strongest material ever made. It is the strongest material ever made.

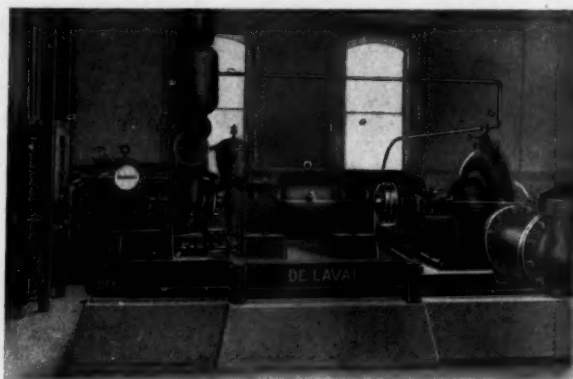
The Cast Iron Pipe Publicity Bureau
1 Broadway, New York

Cast Iron Pipe Soon Celebrates Its Centenary in Philadelphia

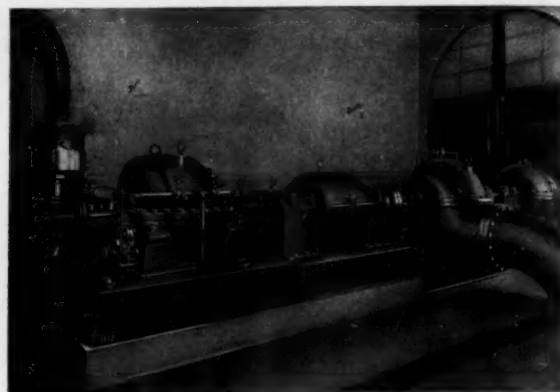
This water pipe of the first American city to use cast iron pipe—1817 was the date of its installation here, and pipe laid there during the course of its history. After the "experimental" stage was passed, Philadelphia bought heavily of Cast Iron Pipe. The pipe was laid in the city streets and in the water works. The pipe was laid in the city streets and in the water works. The pipe was laid in the city streets and in the water works.

The Cast Iron Pipe Publicity Bureau
1 Broadway, New York

Publicity Bureau
New York



De Laval Steam-turbine-driven Centrifugal Pumping Unit at the Reservoir Pumping Station of the City of Davenport, Iowa; capacity, 5,000,000 gals. per day against 40 or 70 lbs. per sq. in. pressure, depending upon the speed at which the pump is operated.



De Laval Steam-turbine-driven Centrifugal Pumping Unit at the Walnut Street Pumping Station, Lynn, Mass. The single-stage pump is capable of delivering 13,000,000 gals. per day against 145-ft. head, and the two-stage pump 2,000,000 gals. per day against 225-ft. head. The capacity of both pumps delivering into the low-pressure distribution system is 15,500,000 gals. per day.

Flexibility in Water Works Service

The De Laval Steam-turbine-driven Centrifugal Pump is peculiarly well adapted for meeting variable volume or pressure requirements.

When delivering against a constant head, the volume can be varied through a range of 50% without serious variations in efficiency.

Where widely different heads are required at different times, as for domestic supply service and fire service, two pumps can be installed upon one shaft with piping so arranged that they can be operated either in parallel or in series.

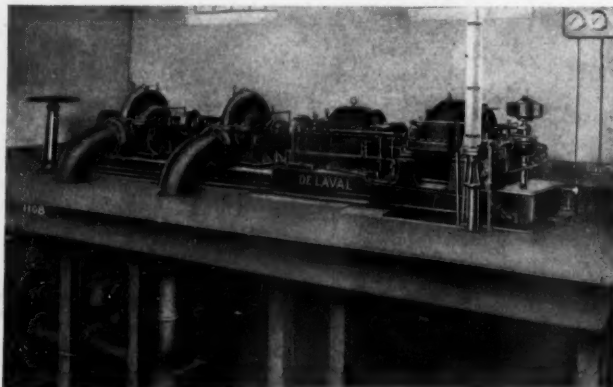
Where water is to be supplied at two different heads simultaneously, two pumps can be mounted upon the same shaft.

De Laval Steam-turbine-driven Centrifugal Pumps are rapidly becoming standard for pumping stations of all capacities because they deliver the most foot pounds of work per dollar of total expense. Not only are the capital charges upon the De Laval Steam-turbine-driven Centrifugal Pump, including first cost of unit, foundations and buildings much lower than those upon reciprocating units, but the fuel expense is through its rapid development and great improvement of efficiency becoming more nearly equal to that of the best triple-expansion reciprocating engine. The centrifugal pump also shows much lower maintenance costs, including supplies, repairs, labor and superintendence.

The rapid ascendancy of the De Laval Steam-turbine-driven Centrifugal Pump is due to its unequalled economy. This type of pumping unit realizes, under usual water works service conditions, the lowest total cost per water horse power.

All phases of this subject are fully discussed in our new publication, "Progress in Water Works Pumps," in which are described and illustrated a large number of prominent installations, with test results in many cases.

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De Laval Steam-turbine-driven Centrifugal Pump installed at the Falls Creek Station of the Indianapolis Water Co.; capacity, 6,000,000 gals. per day against 270-ft. head, but also designed to deliver against 338-ft. head.

DE LAVAL
Steam Turbine Company
TRENTON, NEW JERSEY

lion to 12 million gallons per day." Utilization of the city's interest in the bench canal supply, said Mr. Jones, would increase the supply one-third, for domestic purposes, but the city cannot obtain the pipe to make the necessary connection. The solution of the water problem, he said, will be the building of the great storage reservoir in Skull-crack. Some work will be done on it this summer. The expense of building the big reservoir will be taken out of the revenues of the water department. The three city commissioners oppose any further reduction of the water rate for gardens and they emphasize the benefit of the exemption for each family having two children in school—allowing water free for a garden 16½ by 33 feet.

STREET LIGHTING AND POWER

Kansas Natural Service Held Interstate Commerce.

Topeka, Kans.—The 28 cent gas rate established by the Kansas Public Utilities Commission was held to be non-compensatory, confiscatory, unreasonable low and in violation of the federal constitution, according to a decision by judge Wilbur F. Booth, of the United States District Court, which reached here from St. Paul. Judge Booth, who presided for the district of Kansas, held that the distribution of gas in Kansas by the Kansas Natural Gas company is interstate commerce and not subject in any manner to the restriction, regulations and rulings of the Kansas commission.

Natural Gas Shortage in Ohio.

Cleveland, O.—The East Ohio Gas Co., will not be in a position to deliver a greater amount of gas during the winter of 1917-18 than it did during the winter of 1916-17. This notice was received by mayor Davis in a letter from president M. B. Daly of the East Ohio Gas Co. The East Ohio representative expresses the opinion in his letter to the city that the company has probably delivered the maximum amount of natural gas to Cleveland which it will ever be able to supply. This notice is in response to a recent letter from the mayor asking the company what steps are being taken to care for the city's needs the coming winter. The reply is that the completion of the new twenty-inch main from the Ohio river has increased the company's carrying capacity to an extent greater than that of the field to supply and that the construction of new lines would be futile. It is further suggested in the letter that any relief from the conditions of last winter must be had through the co-operation of the consumers by the installation of auxiliary appliances for the use of coal or other fuel during the period of gas shortages. "No consumer can wisely depend on gas alone for the period between Nov. 1 and March 1," says President Daly in his letter to the mayor. "The wide variations in temperature are so great that the company cannot promise to deliver an adequate supply to all of the residents of Cleveland at all times."

Canton, O.—A 5-cent increase in the price of natural gas will take effect here May 18, mayor Stolberg was informed by president M. B. Daly of the East Ohio Gas Co. Decreases in gas production and increases in the cost of securing and distributing the gas are reasons given for the increase. Canton consumers are paying 33 cents a thousand cubic feet for gas with a discount of three cents per thousand feet if bills are paid in ten days. The new price is 38 cents a thousand.

Village Votes Light Franchise.

Holly, Mich.—In a quiet special election the village electors voted to give the Consumers Power company a 10-year franchise to furnish electric current to the village and its residents and to operate the pumping station. The vote was 122 to 14. This action settles for several years at least the much discussed question of this village's light and water supply, which has been a live topic since the Independent Power company gave up its contract and the matter of municipal ownership of the plant was brought up. While the electors had once gone on record in favor of the municipal ownership plan and funds had been authorized for purchase of the plant, or such other method as might be best adapted to the needs of the town, the council, after an investigation had decided that it did not

believe town ownership the best course at present. For a time the village conducted the plant, to prevent discontinuance of the water and light service, and had better success in meeting the difficulties in the way than the company had experienced. However, it was the general opinion among the councilmen that if the town had any money to spend at this time it would be better to make use of it in other civic improvements and recommended the passage of the franchise. The plan carries with it a provision for a conditional deed of the plant now existing, to the village, and the construction and equipment of a new and more adequate plant by the Consumers company.

FIRE AND POLICE

Reorganizing Police and Fire Departments.

Columbus, O.—By passage of two ordinances re-creating the divisions of police and fire, council has adopted additional recommendations of the New York Bureau of Municipal Research. The chief alteration in the existing system is the abolishing of the grades of reserve patrolmen and sub-firemen. Under the new plan, men in the two departments must serve a probationary period of one year before they become regulars. During this period they will receive pay at the rate of \$2.75 a day. After the first year of service, men in the departments will receive \$1,020 for one year, then \$1,080 for the next year, and finally reach a maximum salary of \$1,100 for the fourth and succeeding years. A lieutenantancy has been created in the division of police with a salary of \$1,500. The position will be filled by promotion from the list of sergeants now on the civil service roll. The lieutenant will have charge of the force at night; the captain of police, who has been in charge of the department at night, will be transferred to day duty.

Six Die in Film Fire.

Indianapolis, Ind.—Moving picture films stored in the basement of a dwelling house were the origin of a serious explosion and fire which caused the death of six occupants of the house and injuries to three firemen. All of the persons killed were on the first floor in the rear part of the three-story building, and windows only a few feet from the ground were available to all. But the flames and fumes came so rapidly that there was no opportunity for the victims to escape. "There is no satisfactory law or ordinance giving the city the proper control of such a situation," said Jacob G. Hilkene, city building inspector. "There are a number of places in which films are stored and some of them we don't know anything about because we get no track of them. A stringent ordinance should be passed immediately to remedy this situation, and the use of any building where people live, for such purposes, should be prohibited." H. H. Friedley, state fire marshal, made public his official findings, following an examination into the causes of the fire. Friedley's report declares that Louis R. Sereinsky, president of the Oxon Chemical Company, which had quantities of motion picture films stored in the basement of the burned building—and "possibly other officers of the company"—"were criminally careless" in the handling of the material. "To leave such large quantities of inflammable materials out of the vault that had been constructed as a safeguard, exposed to a spark of fire or chance ignition, was careless in the extreme, amounting to a criminal disregard of life, and he should be held to account," Friedley declared. Friedley's report also attacks the owners of the building, the Indiana Life Insurance Company, for "giving more thought, evidently, to the paltry \$15 a month [rent] than they did to the safety and welfare of their property or the lives of their tenants." Friedley's report says that "the exact origin of the fire will probably never be known, but the cause of the intense heat and tremendous flames bursting from the basement windows and reaching across a thirty-five-foot street to the top of the three-story Royal Hotel building, plainly shows that the rapid spread of the fire and intense heat that prevented the tenants from escaping can be attributed to the burning films." Friedley then had the following to say of city authorities: "The building commissioner and his assistants, as well as the inspectors from the fire department, are sup-

posed to be familiar with the requirements of this office, for the construction of moving picture booths and the rules and regulations governing their operation. These booths must be built of metal or asbestos and only one reel of films exposed at a time. Any other films in the booth must be kept in separate metal cases. With these rules in mind it is difficult to see how they could pass this basement where all such rules were disregarded in handling this dangerous material in such large quantities. While this criticism is not intended to add to the feeling of regret that these officers now have for this sad occurrence, yet it should be a lesson to them and to others placed in like positions. The municipal authorities should at once enact ordinances providing that films should not be handled or stored where their presence would endanger life or property." An another point the fire marshal's report said: "Two inspectors of the Indianapolis fire department went through this basement ten days prior to the fire and say that while they saw some barrels of films in the basement and some loose films lying around, they do not think that there was any such quantity there at that time as is shown to have been there at the time of the fire."

Two-Platoon System in Effect.

Newark, N. J.—The two-platoon system is now in actual operation in the city fire department and it went into effect with an augmented force of 140 firemen. The initial cost is much greater than was admitted either by the commissioners or the advocates of the system while the campaign for its adoption was on. It went into effect with nearly twice as many new men as was at first contemplated in the plans of the commissioners. It is asserted that it will require still more men and a greater increase in cost before the system can be placed even at the minimum of effectiveness fixed by fire experts. A schedule has been prepared which attempts to make the greatest possible number of men available for emergency calls to service. The experiment is being watched with interest because of a recent warning by Fire Chief Moore. In his annual report he calls attention to the condition of the department with respect to its ability to cope effectively with a conflagration. In declaring the necessity for more new companies, the chief makes this statement: "The present force of companies, equipment and manual strength is inadequate to cope successfully and speedily with a conflagration or any other great emergency where the entire department would be kept at one point of action. Other parts of the city would be exposed." Six new double companies, one new water tower company and a fire boat are included in the recommendations, all of which are repetitions of suggestions previously offered. At present a full company complement is eleven men, including officers. Under the one-day-off-in-six rule, two men are absent all the time. Sickness or other causes further reduce the company strength, on a fair average, possibly, to eight men. This brings the force immediately available to answer at alarms at night, when the work is most difficult and strength is most needed, to about 300 men. Under the arrangement now considered in connection with the two-platoon system it is claimed that the highest number immediately available will be about 240 men. This is the maximum, taking in every man on duty in the city. It leaves altogether out of consideration absences, either by sickness or other reason.

GOVERNMENT AND FINANCE

Citizens Union Completes Twenty Years' Work.

New York, N. Y.—The Citizens Union of this city has just completed its twentieth year of service, and reviewing its work states that "Each year a larger number of citizens have gone to the polls prepared to vote intelligently for candidates for local office. The Union is relied upon for accurate information concerning the work done by the city's representatives in the legislature, the aldermen and the city officials. A review of local civic affairs for the past twenty years finds the Citizens Union in the forefront of every important movement." During the past year it took an active part by registering its opinions of candidates and endorsing those it favored in the last campaign. It maintained its bureau at Albany, where it promoted bene-

ficial measures and worked to defeat detrimental legislation and recorded the work of the city's representatives. It continued its fight for real home rule, better municipal financing, election reforms, and adequate representation. It blocked advancement of some measures threatening alienation of city waterfront property and others proposing a transfer of control of rapid transit construction from the public service commission to other bodies. It co-operated in causing the adoption of the widely-known report of the Commission on Building Districts and Restrictions; it studied the West Side-New York Central deal; investigated the street car strike; worked to resist the weakening of the present restrictions on outdoor advertising; urged municipal control of street railway extensions. During the coming municipal campaign its records of the qualifications of candidates will be particularly effective.

\$3,600,000 Improvements for Bridgeport.

Bridgeport, Conn.—The \$3,600,000 bond issue for 1917 is to be used as follows:

Amount.	Use.	Term.
\$350,000.	Street extensions.....	25 years
750,000.	Pavement	25 years
350,000.	Sewers	25 years
425,000.	Schools	25 years
200,000.	Parks	25 years
100,000.	Police and fire.....	20 years
200,000.	Isolation hospital	20 years
125,000.	Clinic building	25 years
75,000.	Fire motors	5 years

Porto Rican City's Bonds for Improvements.

San Juan, Porto Rico.—The municipality of San Juan has just sold \$915,000 5 per cent refunding improvement bonds at \$107.37 to bond buyers from the United States. The premium places the bonds on a 4.656 per cent basis, the best rate at which any municipal bonds of the island have ever been sold. Of the proceeds of the bonds approximately \$100,000 is for refunding purposes and the balance is for the following municipal improvements: Opening and paving of streets, \$412,000; sewers, \$300,000; garbage incinerator, \$50,000; three public laundries, \$45,000. Within a short time the city will offer for sale an additional lot of \$785,000 5 per cent bonds, the proceeds of which will be applied to building a new water system.

MISCELLANEOUS

\$62,000,000 Proposed for St. Louis Improvements.

St. Louis, Mo.—The detailed report of a board of five engineers, recommending public improvements to be financed by bond issues aggregating \$62,000,000, to promote the commercial and industrial progress of St. Louis, and to make the city more attractive residentially, has been made public by the Chamber of Commerce. Included in the plan are river front improvement; reconstruction of the central part of the city, from Twelfth street to Grand avenue, along the lines of a modified parkway plan, widening Pine street to the nearest alley on either side, with a park in front of Union station; waterworks extension; improvement of River des Peres, municipal railroad along the river front; drives, reservations and park additions and improvements; grade crossing elimination; sewer additions and extensions; and other improvements of importance. The park, street, sewer and grade crossing parts of the recommendations, and some minor ones endorse recommendations made by members of the Board of Public Service. The board of engineers began work last July, and its expenses were met by the Commercial Club and the Chamber of Commerce. Julius Pitzman was chairman of the board, and the other members were Frank Jonah, chief engineer of the Frisco Railroad; Baxter L. Brown, chief engineer of the Alton & Southern Railroad; Edward Flad and M. L. Holman, former water commissioners. The board of engineers was appointed to prepare plans for river front improvement, but their work was broadened, after a few months, to include first the subject of terminal facilities, which was intimately connected with that of the river front, and later the other needed steps in city development. In its report the engineers say that the commercial advancement of St. Louis has been retarded by (1) the high price of property available

for industrial purposes; (2) lack of sufficient switch tracks, terminal facilities and team yards for handling freight; (3) lack of proper accommodation for suburban transportation; (4) excessive charges for switching within the city limits; and (5) high charges for water for manufacturing purposes.

The plan of the engineers for river front improvement is to retain the levee between Chestnut and Carr streets, with its present paving, for use of the existing type of steam boats. South of Chestnut a vertical retaining or quay wall, 54 feet high, would be built, and the river dredged, to make possible the loading and unloading of boats by traveling cranes and other modern machinery from and to warehouses located west of this wall and south of Spruce street, which will have railroad and truck facilities adjoining. This wall can be extended as far south as the demands of business require. Between Chestnut and Spruce streets and west of the quay wall a reservation for a river front park is proposed. The present elevated railroad structure is to remain, and a double track line is to be added to the east of it. This track would descend to ground about Carr street, and the plan north of that street fits in with the plan for the municipal railroad. The construction of this additional elevated line, however, is not advised at present. The total cost of this plan of river front improvement is figured at \$6,600,000.

The engineers then propose the completion of the municipal railroad along the river front, from the Chain of Rocks to River des Peres. The recommendation is that the present line be extended a distance of 2.32 miles, to connect there with the tracks to be obtained from the St. Louis Transfer Railway Co. The North Market street docks now under construction by the city will be served by this extension.

The tracks to be obtained from the St. Louis Transfer Railway Co. are to be extended a distance of 4.56 miles, to a connection with a proposed railroad in the River des Peres Valley. This extension will pass through the city workhouse property, where sufficient room can be provided on the city property for a municipal storage and distribution yard for the economical handling of the city's supplies and for the gradual construction of an extensive interchange or clearing yard, as the development of traffic on the municipal railway may require.

An added detail of this plan is the shifting of the harbor lines, to widen the levee between the free bridge and President street about 108 feet, yielding the city about 22.5 acres of land. The cost of the whole municipal railroad plan is figured at \$1,100,000. The next proposal is for an additional approach to the free bridge, on the St. Louis side, for freight traffic. For the improvement of the River des Peres, the plan made by W. W. Horner, engineer in charge of the division of design of the city sewer department, made public last December, is indorsed without change by the engineers.

The recommendations planned and urged as to water-works extensions are: 1. An issue of \$20,000,000 water-works bonds; 2. That the water rates be lowered "to produce no more than a reasonable and safe excess above the amount of revenue required," and 3. That future extensions be paid for from the proceeds of the bond issue, which shall run for 10 years if legal authority for so long a term can be obtained. The reduction in rates suggested is from 7 cents to 4 or 5 cents a thousand cubic feet. A liberal policy in permitting the piping of water direct from the river, for industrial purpose, is urged.

King's highway should be finished according to the existing plan, it is declared, and a recreation pier should be built, extending into the river. Reservations aggregating from 10,000 to 20,000 acres for recreation and camping purposes, are also recommended and five places are suggested. The engineers recommended that a bill now pending in the Legislature for a constitutional amendment lengthening the term of bond issues, be supported. The proposed amendment would permit the issuance of bonds for a period to equal the useful life of the improvement to be provided. The present limit is 20 years. A 50-year period would not be too long in the case of some improvements, it is held. In a plan for a River des Peres railroad, and for the development of the industrial district to be built up by the proposal improvement, it is proposed that the railroad be built in connection with the sewer, up the River des Peres to Lindenwood, in connection with the river front municipal railroad. The estimated cost of the River des Peres railroad is \$1,200,000. The subject of reconstruction of the central part of the city, between Twelfth street and Grand avenue, is then taken up.

The parkway plan, defeated at the polls, is condemned as having been inequitable in its proposed assessments. The plan proposed by the engineers, it is explained, is for "the improvement of one east and west street at a time, condemning the property from the alley on the north to the alley on the south, the cost of the property condemned to be paid for out of a bond issue. The street would then be substantially widened and the lots on each side, having a depth of about 75 feet, could be resold or leased to private parties under restriction as to the nature of the improvements, subject to the approval of the city authorities." The recommendations of the engineers are summarized as follows:

Improvement of the river front.....	\$6,600,000
Municipal railroad along the river front and from Chain of Rocks to River des Peres.....	1,110,000
Municipal Bridge approach to Levee tracks.....	950,000
Improvement of River des Peres.....	6,600,000
River des Peres railroad and development of an industrial district	1,300,000
Reconstruction of central part of city between Twelfth St. and Grand Ave.	10,000,000
Water works extension	20,000,000
Drives and reservations	3,000,000

The following were recommended by directors of public service and indorsed by engineers:

Additional parks, playgrounds, swimming pools and improvements to existing parks	\$3,500,000
Motorizing fire department.....	400,000
Requirements of street and sewer departments, providing for material yards, asphalt plants, incinerating plant, fireproofing municipal stables, building for housing tools and equipment in various parts of the city.....	650,000
Bridges and elimination of grade crossings.....	2,000,000
Sewer additions and extensions.....	3,650,000
Municipal farm	450,000
Koch Hospital for Tuberculosis	250,000
Markets	750,000

Total\$61,260,000

City Weights and Measures Departments.

Washington, D. C.—Requests for information in regard to establishing departments of weights and measures have been received recently by the United States Bureau of Standards from the mayors of certain cities in the states of Alabama, Arkansas, Illinois, Missouri, Oklahoma, South Carolina and Texas. The bureau has been able to send them valuable material for the drafting of an ordinance and for practical methods of carrying its provisions into effect. Cities thus assisted are able from the outset to proceed with the important work involved in the regulation of weights and measures along lines that have been found by many cities to be just, practical and efficient.

Districting in Iowa Cities.

Des Moines, Ia.—Governor Harding has signed the Parker bill for districting in the larger Iowa cities. The measure authorizes cities of the first class to establish restricted residence districts and permits the exclusion of buildings for certain purposes.

City Closes Coal Business.

Frankfort, Ky.—The city has quit the coal business, the last three cars of coal having been disposed of, according to an announcement by mayor Rupert. The advent of warm weather, he said, had witnessed a great decrease in the number of orders received at the office of the city clerk. City teams that have been in use in hauling coal have been turned over to the work of the spring clean up and other service. The municipal coal market was inaugurated several months ago when local coal merchants announced an increase in the price of coal to twenty-five cents on the bushel. The city sold the fuel at nineteen cents. During the time that the city has remained in the coal business it has sold over fifty cars of coal.

To Lease State-Owned Iron Plant and Railroad.

Austin, Tex.—Governor Ferguson has signed the House concurrent resolution providing for the sale of the state's iron plant at Rusk penitentiary, on the condition that the purchasers operate it for one year to demonstrate the commercial value of the east Texas iron ore. It is understood that this resolution was adopted at the instance of capitalists who would give the iron furnace and plant, including the pipe foundry at Rusk penitentiary a fair and extensive test. It has always been contended that the state has never properly financed the iron industry at Rusk and therefore it has never had the opportunity to demonstrate the value of Texas iron ores. It is said, however, that the railroad rates in the state are prohibitive so far as the iron industry is affected. The governor has also signed the House bill providing for the sale or lease of the state railroad or the issuance of bonds to finance an extension thereof to some commercial center, offering a sufficient bonus with a view to making that property profitable. It has been reported that persons planning to take over the iron furnace at Rusk might also take over the state railroad in the same connection and use it to secure divisions in handling raw materials in the furnace and pig iron and pipe outbound.

NEWS OF THE SOCIETIES

Calendar of Meetings.

May 7-11.—AMERICAN WATERWORKS ASSOCIATION. Thirty-seventh annual convention, Richmond, Va. Secretary, J. M. Diven, 47 State Street, Troy, N. Y.

May 7-9.—NATIONAL CONFERENCE ON CITY PLANNING. Annual conference, Kansas City, Mo. Secretary, Flavel Shurtleff, 19 Congress Street, Boston, Mass.

May 8-9.—INSTITUTE OF PAVING BRICK MANUFACTURERS. Convention, St. Louis, Mo. Secretary, H. H. MacDonald, 830 B. of L. E. building, Cleveland, O.

May 8-10.—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting, Washington, D. C. Secretary-treasurer, Franklin H. Wentworth, 87 Milk Street, Boston, Mass.

May 8-9.—AMERICAN ASSOCIATION FOR PROMOTING HYGIENE AND PUBLIC BATHS. Annual convention, Pittsburgh, Pa. Secretary, J. L. Mason, City Hall, Philadelphia, Pa.

May 9, 10.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Conference, New York City. Secretary, T. Commerford Martin, 29 West 39th St., New York, N. Y.

May 9-11.—NATIONAL ASSOCIATION FOR THE STUDY AND PREVENTION OF TUBERCULOSIS. Annual conference, Cincinnati, O. Secretary, Dr. Charles J. Hatfield, 105 East 22d St., New York, N. Y.

May 15.—FEDERAL, STATE AND MUNICIPAL DEPARTMENTS OF ART. Second annual conference, Philadelphia. Secretary, Andrew Wright Crawford, City Hall, Philadelphia, Pa.

June 1-4.—AMERICAN ASSOCIATION OF MEDICAL MILK COMMISSIONERS. Annual meeting, Brooklyn, N. Y. Secretary, Dr. Otto F. Geler, Ortiz Building, Cincinnati, O.

June 4-5.—AMERICAN ACADEMY OF MEDICINE. Annual meeting, New York City. Secretary, Dr. Thomas W. Grayson, 1101 Westinghouse Building, Pittsburgh, Pa.

June 4-8.—AMERICAN MEDICAL ASSOCIATION. Annual meeting, New York City. Secretary, Frederick R. Green, 635 North Dearborn Street, Chicago, Ill.

June 6-13.—INTERNATIONAL ASSOCIATION OF POLICEWOMEN. Annual meeting, Pittsburgh, Pa. Secretary, Mrs. G. Sharrot, 40 Court House, Minneapolis, Minn.

June 6-13.—NATIONAL CONFERENCE OF CHARITIES AND CORRECTIONS. Pittsburgh, Pa. Secretary, Wm. T. Cross, 315 Plymouth Court, Chicago, Ill.

June 11.—NEW YORK STATE CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS. Annual conference, Buffalo, N. Y. Secretary, W. F. Capes, 26 Washington Ave., Albany, N. Y.

June 13-15.—NATIONAL ASSEMBLY OF CIVIL SERVICE COMMISSIONS. Annual meeting, Boston, Mass. Secretary, John T. Doyle, 1724 F St., N. W., Washington, D. C.

June 13-15.—MARYLAND STATE FIREMEN'S ASSOCIATION. Twenty-fifth annual convention, Cumberland, Md. Secretary, William Weagly, Westminster, Md.

June 26-30.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J.

July 30-Aug. 3.—SOUTHERN SOCIOLOGICAL CONGRESS. Annual meeting, Blue Ridge, N. C. Secretary, J. E. McCulloch, 508 McLachlen Bldg., Washington, D. C.

Sept. 11-14.—NEW ENGLAND WATERWORKS ASSOCIATION. Annual convention, Hartford, Conn. Secretary, Willard Kent, 715 Tremont Temple, Boston, Mass.

Oct. 17-18.—LEAGUE OF MINNESOTA MUNICIPALITIES. Fifth annual convention, St. Cloud, Minn. Secretary-treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Nov. 12-16.—AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, 469 Transportation Building, Chicago, Ill.

Nov. 20-23.—PLAYGROUND AND RECREATION ASSOCIATION OF AMERICA. Recreation Congress, Milwaukee, Wis. Secretary, H. S. Braucher, 1 Madison Ave., New York, N. Y.

National Conference on City Planning.

The ninth National Conference on City Planning will be held at Kansas City, Mo., on May 7, 8 and 9. This is the first time that this important body will have met west of the Mississippi River. The program follows:

Monday, May 7.

Registration, 9 to 11 a. m., at Hotel Muehlebach.

The general chairman for the sessions of Kansas City day will be George E. Kessler, of St. Louis, the designer of the Kansas City park system.

First conference session, 11 a. m.

"Interurban Passenger Terminals," George A. Damon, dean of Throop College of Technology, Pasadena, Cal.

"The Industrial Terminal and Its Relation to the City Plan," A. Pearson Hoover, consulting engineer, New York City.

Luncheon, 12.30 p. m.

Address of welcome, Hon. George A. Edwards, mayor of Kansas City.

Three-minute reports of city planning activities in cities represented.

Second conference session, 2.30 p. m.

"Traffic Ways," Curtis Hill, city engineer, Kansas City, Mo.

"Relation of Traffic Ways to Parks and Boulevards," W. H. Dunn, superintendent of parks, Kansas City, Mo.

"Street Widening to Meet Traffic Demands," Nelson P. Lewis, chief engineer Board of Estimate and Apportionment, New York City.

President's address, "City Planning Needs of Kansas City, With Special Reference to the Treatment of Water Courses," Frederick L. Olmsted, Fellow American Society of Landscape Architects, Brookline, Mass.

"The Waterways of the Bronx, New York" (illustrated by slides), Jay Downer, engineer Bronx Parkway Commission, New York City.

"Acquirement of Kansas City Park and Boulevard System and Its Effect on Real Estate Values," William Buchholz, president Park Commission, Kansas City.

"Kansas City Park System and Its Effect on the City Plan," George E. Kessler, St. Louis.

Tuesday, May 8.

Breakfast conference, 8 a. m., Renaissance room, Baltimore Hotel, "Protecting Residence Property by Restrictions."

A parade of all municipal equipment of Kansas City will pass Muehlebach Hotel at 9.30 a. m.

Fourth conference session, 10 a. m.

Chairman, George B. Dealey, Dallas, Texas. "The Planning of Cities and Towns."

"A State Campaign for City Planning," Lee J. Ninde, Fort Wayne, Ind., past president Real Estate Association of Indiana.

"How to Start in a Small City," George L. Goemann, member Plan Commission, Mansfield, Ohio.

"The Development of the Plan," Thomas Adams, town planning adviser, Commission of Conservation of Canada, Ottawa.

Luncheon, 12.30 p. m. Combined luncheon of all organizations in Kansas City with delegates to conference, Convention Hall (plates provided for 2,000 people).

Speaker, J. Horace McFarland, president American Civic Association, Harrisburg, Pa.

The afternoon will be spent in a motor tour of the city. The trip will include the famous Country Club district, a restricted district of 1,000 acres, devoted to high-class suburban development. A stop will be made at the Mission Hills Country Club.

Fifth conference session, 8 p. m.

"Districting," Lawson Purdy, president Department of Taxes and Assessments, New York City.

"Districting Procedure and Results in California," Howard Robertson, City Attorney, Los Angeles; Charles H. Cheney, secretary California Conference on City Planning, Berkeley, Cal.

"The Legal Status of Districting," Edward B. Bassett, special counsel of the New York Commission on Districting, New York City.

Discussion in a city attorney's section, led by Alfred Bettrain, former city solicitor of Cincinnati.

Wednesday, May 9.

Breakfast conference, 8 a. m., tea room, Muehlebach Hotel. "City Planning Activities of Small Towns."

Sixth conference session, 10 a. m.

Chairman, Lawrence Veiller, secretary and director, National Housing Association, New York City. Practical Application of City Planning With Concrete Examples.

Both the morning and afternoon sessions will be taken up with consideration of several city planning topics. Any member of the conference or anyone expecting to be present at the sessions may present or send question for discussion, which will be received up to 4 o'clock Monday afternoon. These questions will be balloted upon at the morning and afternoon sessions of Tuesday and those receiving the most votes will be discussed in the order of their preference.

Business session, 4.30 p. m.

The conference will close with a dinner at which the members will be the guests of Kansas City. The speakers who have already accepted are John Lawrence Mauran, president American Institute of Architects, St. Louis, and Lawson Purdy, president Department of Taxes and Assessments, New York City.

United States Good Roads Association.

At the fifth annual convention of this association, held at Birmingham, Ala., April 17-20, officers were elected as follows:

President, Senator John H. Bankhead; first vice-president, Governor Charles H. Brough, of Arkansas; second vice-president, E. J. Watson, Columbia, S. C.; third vice-president, John W. O'Neill, Birmingham; secretary-treasurer, J. A. Rountree, Birmingham.

Directors—Alabama, Gov. Charles Henderson, F. A. Gullledge, Verbena; Arizona, Del M. Potter, Clifton; B. F. Billingsley, Duncan; Arkansas, J. E. Bodman, Little Rock; O. N. Killough, Wynne; California, S. Eugene DeRackin, Imperial; Florida, D. C. Gillett, Tampa; J. Walker Pope, Winter Park; Georgia, M. J. Abney, Athens; T. E. Patterson, Griffin; Indiana, A. R. Erskine, South Bend; Illinois, W. K. Phil-

lips, Metropolis; C. F. Jamison, Chicago; Kansas, Governor Arthur Capper; Kentucky, P. L. Atherton, Louisville; Louisiana, R. H. Dowman, New Orleans; W. E. Monroe, Delhi; Mississippi, J. A. Carr, Hattiesburg; George F. Grayson, Biloxi; Missouri, E. W. Major, Sedalia; Nevada, James T. Goodin, Lovelock; Graham Sanford, Reno; Nebraska, William Stull, Omaha; New York, John H. Gordon, Albany; Hampton D. Ewing, New York; North Carolina, C. M. Vanstory, Greensboro; Michigan, Harry M. Jewett, Detroit; Oklahoma, E. W. Marland, Ponca City; R. W. Dick, McAlister; Pennsylvania, S. Jones Phillips, Kennett Square; South Carolina, Reid Whitford, Charleston; F. Horton Colcock, Bluffton; Tennessee, John Howe Peyton, Nashville; J. J. Gray, Rockdale; Texas, H. B. Terrel, Austin; Charles B. Munday, Marlin;

(Continued on page 654.)

PERSONALS

Bergen, Van Brunt, who was chief engineer of the Department of City Works of the old City of Brooklyn from 1894 to 1896, died April 27 at his residence in that city.

Mr. Bergen was educated at the Brooklyn Collegiate and the Polytechnic Institute, from which he graduated in 1860, and the Rensselaer Polytechnic Institute of Troy, from which he graduated with the degree of Civil Engineer in 1863. He entered the Department of City Works of the City of Brooklyn in 1864 as a rodman, and gradually worked his way through the ranks until in 1894 he was appointed chief engineer. He retired in 1896. He was a member of the American Society of Civil Engineers.

Cleveland, Dr. Frederick A., has resigned as Director of the New York Bureau of Municipal Research. E. P. Goodrich will continue the charge. Mr. Cleveland has taken a place in Boston with a corporation, but will continue to give the bureau his counsel on technical and scientific matters.

Flad, John, has been appointed to the Missouri Service Commission by Gov. Gardner.

Garden, H. M., city engineer of San Angelo, Texas, has resigned.

Lull, Reid, of Spartanburg, S. C., has been elected highway engineer for that county.

Meyers, O. C., has been appointed commissioner of public works of Schenectady, N. J.

Nunn, Herbert, has been appointed engineer to the State Highway Commission of Washington.

Richard, C. R., has been appointed dean of the college of Engineering, University of Illinois.

Taylor, Lewis, has been appointed as the fourth member of the Indiana State Highway Commission. Dr. Glopper, Martin, has resigned as engineer for Oakland County, Mich.

Wood, D. C., has been appointed by the State Public Utilities Commission of Illinois as acting chief of the service division in the engineering department, succeeding Stanley P. Farwell, resigned. Mr. Wood is a graduate of the University of Illinois in the electrical engineering course, and has been with the commission as assistant engineer for nearly three years.

The following officials have been elected in Texas:

Jefferson—R. J. Daniels, re-elected mayor and E. R. Hicks, city treasurer.

Stamford—R. L. Penick, mayor; W. M. Harlan and Charles Brewington, aldermen.

Cooper—Mayor, H. E. Coburn; aldermen, J. T. Morgan, W. M. Wallace, W. G. Ellington, J. L. Yoakum and Marion Tynes.

Canadian—Mayor, W. A. Palmer; city clerk, H. B. Spiller; city marshal, B. F. Anderson; aldermen, C. W. Allen, Richard Kite and P. J. Davis.

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

In extending its WATER DISTRIBUTION SYSTEM, Gross Point, Ill., has the consulting engineering services of Windes & Marsh, Winnetka, Ill.

Vernon, N. Y., is to make PAVING IMPROVEMENTS, plans having been completed by W. G. Stone & Son, 18 Mann building, Utica, N. Y.

The borough of North Arlington, N. J., is to install a SEWAGE DISPOSAL PLANT. Thomas F. Bowe, East Rutherford, N. J., has been retained as engineer.

Bound Brook, N. J., is making a number of PAVING IMPROVEMENTS. The engineers in charge are the Durham Clarin Co., 109 Park avenue, Plainfield, N. J.

Mt. Ranier, Md., is to construct new SEWERS, WATERWORKS and a WATER DISTRIBUTION system. The plans for the work were prepared by Harry Stevens, Union Trust building, Washington, D. C.

Improvements to its WATERWORKS and SEWER SYSTEMS are to be made by Casey, Ill. Plans and specifications for the work were prepared by Chas. Brossman, Merchants Bank Building, Indianapolis, Ind.

Wayne County, Richmond, Ind., is to construct a reinforced concrete BRIDGE. The consulting engineer is J. L. Harrington, of Harrington, Howard & Ash, Orear-Leslie building, Kansas City, Mo.

A SEWER SYSTEM and WATER and LIGHT EXTENSIONS are improvements contemplated by Okemah, Okla. The city has retained the Benham Engineering Company, Colcord building, Oklahoma City, Okla., as consulting engineers.

The water board of Cortland, N. Y., is to make a number of improvements to its WATERWORKS, including the installation of a 4,000,000 g. p. d. pump. Plans and specifications were prepared by H. C. Hodgkins, 514 Dillaye building, Syracuse, N. Y.

Huntington, Ore., has voted bonds for building SEWERS and WATERWORKS extensions. The engineers are Stanley & Bailey, Baker, Ore.

Ogdensburg, N. J., is improving its WATERWORKS system, plans and specifications having been completed by H. N. Blunt, Palmerton, Pa.

Odessa, Mo., is to construct WATERWORKS from plans and specifications prepared by Black & Veatch, 507 Interstate building, Kansas City, Mo.

Listowel, Ont., is to construct a concrete RESERVOIR. The engineers are Bowman & Connor, 31 Queen street, W., Toronto, Ont.

SEWERAGE improvements to be made by Harrison, Ark., have been planned by the engineer, A. C. Moore, Frisco building, Joplin, Mo.

SEWER and WATER MAIN extensions are to be installed by Tennille, Ga. The engineer who prepared plans and specifications is Arthur Pew, 500-1 Forsyth theatre building, Atlanta, Ga.

SEWER extensions are to be made by West Park, O., from plans and specifications prepared by the Lander Engineering Co., 306 American Trust building, Cleveland, O.

Vancouver, B. C., has been considering plans for its HARBOR DEVELOPMENT. Schemes prepared by A. D. Swan, Montreal, have been approved by the commissioners.

A SEWERAGE SYSTEM is to be constructed by the city of Valentine, Neb. Plans and specifications for the improvement have been completed by the engineers, Bruce & Standeven, Omaha, Neb.

In building about seventy miles of HIGHWAYS, the Mill r county highway and bridge district, Texarkana, Ark., has the engineering services of Lound & Hill, 527 Southern Trust building, Little Rock, Ark., and Christian & Ayers, 425 State National Bank building, Texarkana, Ark.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

ROBERTS FILTER SYSTEM.

For Waterworks for Small Municipalities.

The accompanying illustration shows in elevation a typical concrete gravity filter plant of the Roberts System for water supply of small cities. The plant is of the "air and water wash" type and has a capacity of 1,000,000 gallons per 24 hours. The numbers used in the following description refer to the correspondingly numbered parts in the illustration:

The water flows from the source of supply into the low duty pump suction well (16), from whence it is taken by the low duty pump (15), through the low duty suction line (17). It is discharged through (5), the unfiltered water supply pipe to the subsidence basin (1), after passing through an automatic water control (26).

A stilling wall (24) distributes the flow in the subsidence basin, preventing "dead corners," and enabling the utilization of the entire capacity of the basin. This capacity is sufficient to allow the proper period of subsidence and coagulation, the coagulant being prepared in concrete, wood or steel chemical solution tanks (12) and applied at inlet to subsidence basin through the chemical feed pipe (21).

The water is taken from the subsidence basin over a skimming weir (25) through the treated water influent pipe (22) to the filters, two of which are shown. During the filtration the water flows into and fills the concrete pocket in front of each of

the filter units; rises to the level of the tops of the cast-iron supply and wash troughs (2), and spills over onto the sand bed. It filters through the sand and gravel material (30) and is collected by bronze strainers into the cast-iron strainer system (29).

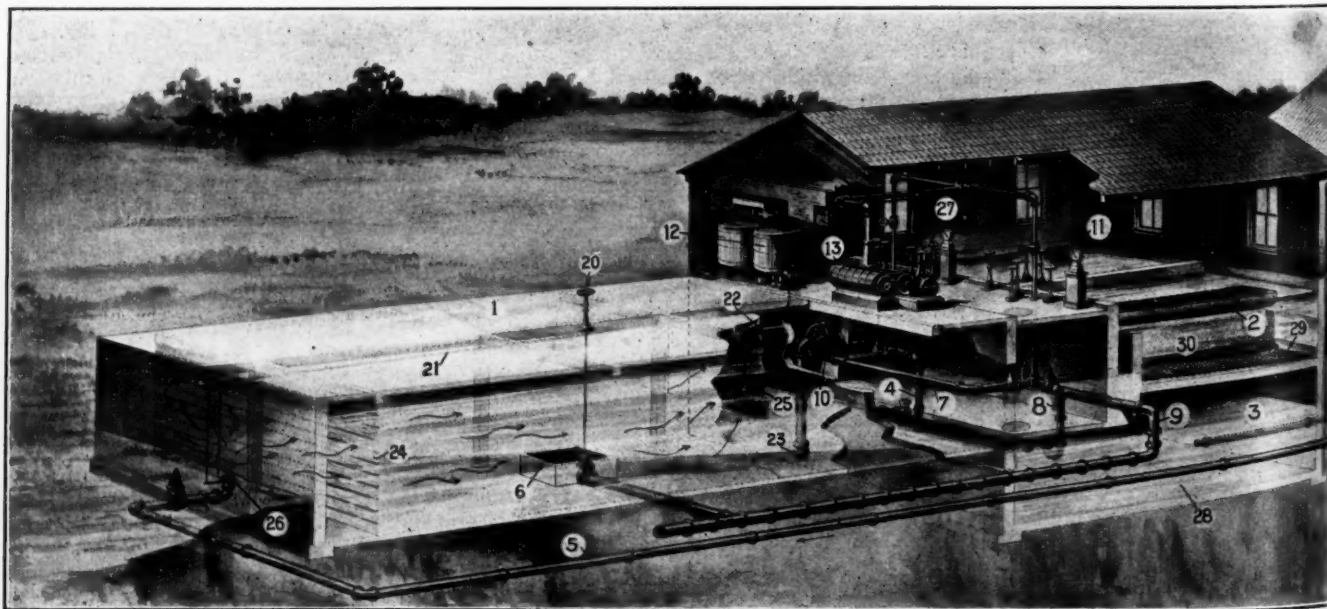
It is then collected through the central cast iron manifold collecting pipe across the front of the filter through the effluent pipe (4 and 8) to the effluent rate controllers. These are set to deliver a given quantity of water under a definite head and allow of adjustment to within 30 per cent. above or below the normal rate for which they are designed. The filtered water is then delivered to the clear well (3), from which it is taken through the clear water suction (19) by high service pump (14) and discharged through the distribution main (18) to the consumers.

In the air-wash system there is a separate and distinct air piping and distributing system laid contiguous to the water manifold. Air and water are used simultaneously in washing the filter bed, resulting in greater economy and efficiency in the washing operation. It is said that if air alone is used it will not lift the sand bed or break it up sufficiently, while in a properly constructed filter a reverse current of water will float the sand bed and break it up completely—the water loosening while the air agitates. This method, it is claimed, gives a material saving in wash water consumed and better scouring and cleansing of the sand. Through the wash water pump (10) is supplied the wash water, while a blower (13) supplies

the air under pressure. During the washing process the inlet valve to the filter is closed; the water on the sand being allowed to filter through the rate controller into the filtered water storage well. The effluent valve is closed, the water remaining in the filter bed to a depth of about six inches from the sand line. The blower is then started (the air supply valve being opened on the filter) and air through (27) the supply pipe, admitted to the bed. The air supply is then shut off, the wash pump started and filtered water admitted to the filter through the manifold and strainer system, the wash water supply coming through (7). A reverse current is thus obtained for a period sufficiently long to allow of thorough washing of the sand and the heavy deposits which have been filtered out of the water are carried to the supply and wash troughs and thence to the waste and drain (9).

After the washing process the sand settles back into its normal position in the bed, the heavier particles settling on the bottom, with the finer grades toward the surface. The air and wash water supply valves are closed, the influent and filtered water to waste valves opened, allowing the treated water to filter through the sand bed as during filtration; the water passes to the drain for several minutes and is then stopped and the filter effluent is again opened to allow the water to go to the clear well.

Loss of head gauges (11) indicate (or indicate and record, if desired) the loss of head due to the accumulation of foreign matter on the filter-



DIAGRAMMATIC ELEVATION OF TYPICAL CONCRETE GRAVITY

ing material and sound, by electrical alarm, the time for washing. Depth gauges to record the depth of water in the subsidence basin and clear well may also be installed. The plant shown is of the hand-operated type, but operating tables for hydraulically operated valves can be installed.

A few parts of the equipment have not been mentioned in the description. Drain pump (6) is provided in the subsidence basin to permit flushing the basin readily. The subsidence basin is also provided with a blow-off valve (20). A foot valve on the wash pump suction is indicated by (23).

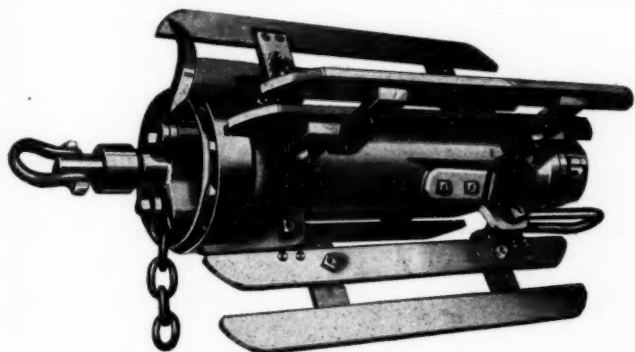
A large number of municipal water plants in the United States and Can-

WATER MOTOR

For Kuhlman Sewer Cleaning Machine.

The Kuhlman sewer cleaning machine, which has been described in these pages and the operation of which in Zanesville, O., was discussed by public service director W. W. Roach on page 580 of last week's issue, may be effectively operated by a water motor. The special motor furnished with the outfit is constructed on simple lines and is designed to work successfully on a pressure of 35 pounds and over. It is made of hard brass and phosphor bronze.

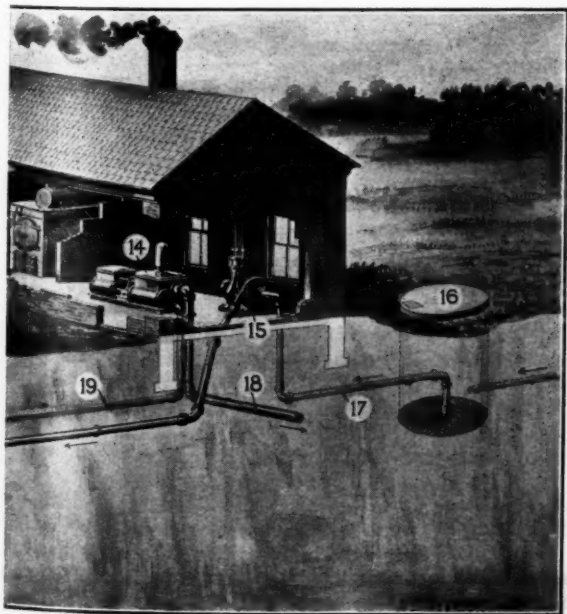
The motor has eleven nozzles of 5/16 inch diameter, which direct their



WATER
MOTOR
FOR
KUHLMAN
SEWER
CLEANING
MACHINE

ada use the Roberts' System. Among these may be mentioned New Orleans, La. (which has the equipment for a daily capacity of 40,000,000 gallons), Grand Rapids (20,000,000) and Edmonton, Canada. Others having plants with capacities 2,000,000 gallons or higher are: Algiers, La., Three Rivers, P. Q., Saskatoon, Sask., Fort Collins, Colo., Bowling Green, Ky., Tarentum, Pa., Manchester, Va., and Laredo, Tex. Only a few days ago the City of Hyacinthe, P. Q., Canada, let a contract for this type of filter plant to cost \$121,000.

The system described is made by the Roberts Filter Manufacturing Co., Inc., Darby, Pa.



FILTER PLANT OF ROBERTS' SYSTEM.

streams of water directly against a set of fins on the revolving head of the motor, exciting power to drive it at a sufficient speed. The head is journeled to the phosphor bronze shaft. This being the only journal on the machine, the friction is reduced to a minimum, allowing the full power to be utilized in operating the head. To the head are pivoted the root cutting knife and agitator chain. Owing to the high speed at which the motor head revolves, centrifugal force holds the knife in a cutting position, but when it strikes a solid object, it can turn back on its pivot until it passes the obstruction, and then quickly regain its original cutting and agitating position. The knife on the motor will cut through any mass of roots if the blades are kept sharp. Various sizes of knives are furnished for the different sized sewers.

The agitator chain is similarly pivoted to the revolving head and turns like the knife. Its work is to stir up the deposits and clean or scrub the wall of the sewer by its continued swirl. The water, after leaving the fins of the revolving head, is projected slightly forward in a conical formation, pushing the deposit forward as it is agitated by the chain or knife, the lighter material flowing down with the stream of water, the roots and solids being pushed forward to be removed at the next manhole. The motor is

provided with an adjustable slide frame which may be adjusted for the various sized sewers. For cleaning small size sewers, such as 8 and 10-inch, the slide frame must be removed entirely.

The water motor, which is shown in the accompanying illustration, is a product of the Champion Potato Machinery Company, Hammond, Ind.

INDUSTRIAL NEWS

Cast Iron Pipe.—Chicago.—All proposals on the 5,000 tons of water pipe for which the city of Winnipeg, Man., took bids have been rejected. Although the engineers at work on the proposition favored placing contracts, the board of commissioners thought otherwise when it saw the prices. The United States Cast Iron Pipe & Foundry Company probably will secure 400 tons required by Salt Lake City, Utah. Jamestown, N. D., let 250 tons last week. The high cost of pipe iron is holding up business for the pipe makers. Quotations: 4 inch, \$58.50; 6 inch and larger, \$55.50, with \$1 extra for class A. Birmingham.—The advance of \$5 per ton in cast-iron pipe has created the impression with makers, as other advances have, that orders will decrease. However, in spite of the successive rises, immediate necessities have resulted in business sufficient to keep plants going as usual. The leading maker is executing an order for 3,000 tons for an Ohio municipality. Quotations: 4 inch, \$53; 6 inch and upward, \$50, with \$1 added for special lengths. New York.—No municipal lettings involving good quantities are in sight at present. Private buying, however, continues excellent and the volume of business from this source is quite satisfactory. Prices are up \$5 per ton. Carload lots of 6 inch, class B and heavier, are now quoted at \$55.50; class A taking the usual extra of \$1 per ton.

Lead.—Lead continues strong, with an upward tendency. Quotations: New York, 9.40 cents; St. Louis, 9.20 cents.

The business of August Mietz, Emma C. Rueff, proprietress, has been sold and transferred to **August Mietz Corporation**, 128-138 Mott street, 87-89 Elizabeth street, New York, N. Y. The officers of the new corporation are: Emma C. Rueff, president; Emil Rueff, vice-president and treasurer; Otto v. Schrenk, secretary; Louis C. Eitzen, general manager. The business will be continued under the corporate form of organization at the same address, and without any change in its policy, under the personal management of Mr. Louis C. Eitzen. The corporation manufactures a line of oil engines.

The Duplex Manufacturing and Foundry Co., which manufactures street castings, etc., announces an important change in management and the removal of its main office to Elyria, O. The retiring president having disposed of his

holdings to other interests, the active management has been transferred to Mr. A. F. Ehrbar. All correspondence is to be addressed to the main office at Elyria.

The International Motor Company, Allentown, Pa., has received an order from the British Government for 150 Mack motor trucks at $7\frac{1}{2}$ tons capacity. The order will amount to more than \$700,000.

Poole Engineering & Machine Co., Baltimore, Md., recently acquired the exclusive manufacturing and selling rights of the turbo-gear, formerly manufactured by the **Turbo-Gear Company, Inc.,** also of Baltimore, through consolidation.

The operation of the **Goodyear Tire & Rubber Company's** cotton mills at Killingly, Conn., has been watched with interest by all textile manufacturers, for this company was the first of the rubber companies of the United States to establish its own cotton mills. Now comes the announcement that upon the completion of the buildings under construction a three-shift eight-hour day will be put into operation. This is a radical departure from the single-shift long day, heretofore prevalent in the textile world.

Markets for Motor Vehicles in the Far East.—Assistance will be given to American manufacturers of motor vehicles by a study of the export problems of this industry in the far Eastern field which has been undertaken by the Bureau of Foreign and Domestic Commerce. Markets in China, the East Indies, Africa and Australia are to be investigated by Mr. Tom O. Jones, who has been appointed special agent by the Bureau. Mr. Jones has been actively interested in American automobile exports for several years, and already has made a tour of the Far East in developing this trade. At the time of his appointment he was advertising and export manager of a motor-car company at Indianapolis. Before sailing, the representative of the Bureau will visit the principal automobile centers in this country to familiarize himself with the needs of individual manufacturers. Exporters who wish to consult with Mr. Jones during this preliminary period should address him at room 409, Custom House, New York City.

NEWS OF THE SOCIETIES

(Continued from page 651.)

District of Columbia, A. G. Batchelder, Washington.

At the opening of the convention on Tuesday, the 17th, Vice-President John W. O'Neill presided. Governor Henderson, of Alabama, in a brief address of welcome on behalf of the state expressed an unqualified interest in the cause of good roads. Commissioner J. D. Truss, of Birmingham, welcomed the delegates to the city. U. S. Senator John H. Bankhead, president of the association, was present on the second

day of the convention and spoke on Alabama's progress in road work. Governor Charles H. Brough, of Arkansas, gave an interesting talk on the road situation in that state. Judge T. E. Patterson, chairman of the State Highway Department of Georgia, declared that the use of convicts on the roads had solved the labor question to a great extent in Georgia, and that he believed their use throughout the United States would not only benefit the convict, but would aid in solving the question of road improvement at a low cost.

A review of the activities of the association was presented in the report of Secretary J. A. Rountree, of Birmingham, which was followed by the appointment of committees on resolutions, national highways and nominations.

American Association of Engineers.

On May 14th and 15th the American Association of Engineers will hold its third annual convention at Chicago to elect national officers for the ensuing year and to consider proposed changes in the national constitution. The convention will be open to all members.

National Electric Light Association.

The annual convention of the National Electric Light Association, which was to have been held at Atlantic City, New Jersey, May 29 to June 1, will be held in New York City, May 9 and 10. Important matters, involving the preparation of the country for war will be discussed by executives of the member companies. The proposed exhibit of manufacturers will be abandoned. Reservations for special trains have been cancelled. Full particulars regarding the further changes in plans and definite announcement respecting the new program will be made public later.

National Fire Protection Association.

The twenty-first annual convention of this association will be held at the New Willard Hotel, Washington, D. C., May 8-10. After the president's address and the reports of the executive committee, secretary-treasurer and editor, the following committees will report:

Membership, I. D. Kingsbury, chairman; public information, F. H. Wentworth; state fire prevention associations, T. R. Weddell; Canadian committee, J. B. Laidlaw; fire and accident prevention day, H. P. Weaver; high value districts, Albert Blauvelt; electrical, F. E. Cabot; marine fire hazards, C. P. Binns; field practice, C. H. Patton.

At the afternoon session of May 10, the committee on private fire supplies from public mains, E. V. French, chairman, will report, as will the committee on standard hose couplings and hydrant fittings, J. H. Howland, chairman. Following this will be round table discussion on hazards of ammunition storage, manufacture and transportation and its regulation. W. D. Milne, John Price Jackson and Col. B. W. Dunn will speak.

At the Wednesday morning session, these committees will report: automatic

sprinkler, C. L. Scofield; standardization of pipe and fitting, W. O. Teague; tanks, Gorham Dana; standpipe systems, W. C. Robinson; roof openings and cornices, Robert Palm; protection of openings in walls and partitions, W. C. Robinson; safety to life, H. W. Forster. Wednesday afternoon, the convention will inspect the bureau of standards.

More committees will report Thursday morning. These will include: explosives and combustibles, A. C. Hutson; laws and ordinances, Albert de Roode; fire-resistive construction, I. H. Woolson; use of wood in building construction, Julius Franke; manufacturing risks and special hazards, Benjamin Richards. There will be round table discussion on safeguarding life in theatres. The following nominations have been made: President, Louis Wiederhold, Jr., Philadelphia; first vice-president, D. Everett Waid, New York; second vice-president, H. O. Lacount; secretary-treasurer, T. H. Wentworth, Boston; chairman of executive committee, F. J. T. Stewart, New York.

National Tuberculosis Conference.

One of the most important national public health conferences scheduled for this spring is the thirteenth annual meeting of the National Association for the Study and Prevention of Tuberculosis, which will convene at Cincinnati on May 9-11, and which will be attended by health officials and physicians from all sections of the country. The addresses and papers at this conference will of course be of deep interest to physicians, but the work of the conference will also have a wider scope. The problem of tuberculosis will be discussed from the legislative and sociological side, as well as from the strictly medical. In fact this is now recognized as one of the most important phases, perhaps the most important phase of the fight against tuberculosis. Physicians know how to treat the diseases—they have long had that information, although of course new situations and problems constantly are arising. But the greatest difficulty in the ultimate elimination of tuberculosis, even in the reduction of its ravages to any marked degree, has been to educate the public to the vital necessity of practical measures.

Among the features to be taken up at the conference which will be of general interest will be the question of interstate legislation. Considerable progress has been made in this direction in recent years, especially by the passing of the Kent law by the federal government. Nevertheless the situation is still in some ways unsatisfactory. Tens of thousands of tubercular patients, citizens of northern and eastern states, have been sent to the west and southwest without proper provision having been made for their care after arrival. Great hardship has been inflicted upon these sufferers by this method and an equal injustice inflicted upon the communities to which they have been sent.

ADVANCE CONTRACT NEWS

ADVANCE INFORMATION BIDS ASKED FOR

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

CONTRACTS AWARDED ITEMIZED PRICES

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
STREETS AND ROADS.				
W. Va.	Beckley	noon, May	4..70 miles concrete, bit. macadam or other pavement	C. L. Scott, Jr., Hwy. Engr.
N. J.	Essex Falls	8 p.m., May	4..4,000-gallon car, 40% asphalt road oil	H. A. Miller, Boro Clerk.
Minn.	Glencoe	1 p.m., May	4..28,000 cu. yds. graveling, 22,000 cu. yds. grading and 6 miles of dragging	F. D. Stocking, Co. Aud.
Ind.	Indianapolis	10 a.m., May	4..50 tons stone bin with engine	L. K. Fessler, Co. Aud.
N. Y.	New York	noon, May	4..25,940 sq. yds. bit. concrete on concrete base	Engr., Bur. of Engrs., St. George, Staten Island.
Ia.	Sioux City	10 a.m., May	5..Paving alleys	C. Kloster, City Clerk
Ore.	Coquille	May	5..Grading three sections of highways	L. W. Oddy, Clerk, Coos Co.
Pa.	Chester	May	5..30,000 yds. pavement, cost \$60,000	J. Messick, Supt. Streets.
N. J.	So. Orange	7:45 p.m., May	7..Sidewalks, curbs and 1,850 sq. yds. bituminous macadam and concrete	I. T. Redfern, Village Engr.
Mo.	Carthage	8 p.m., May	7..Paving several streets with wood block or brick	F. B. Newton, City Engr.
Pa.	Vandergrift	May	7..750 sq. yds. brick paving	W. T. Smith, Boro. Sec.
O.	Springfield	noon, May	7..3,000 sq. yds. sheet asphalt or other pavement	M. J. Bahin, City Engr.
Minn.	Clinton	2 p.m., May	7..4 miles road work	R. C. Schoen, Engr., Ortonville.
N. D.	Minot	May	7..Grading during 1917	R. W. Kennard, Co. Aud.
S. D.	Vermillion	May	7..Cement crossing at streets	C. I. Vaughn, City Aud.
Minn.	St. Paul	10 a.m., May	7..Grading and graveling roads	G. J. Ries, Co. Aud.
N. D.	Dickinson	May	7..Constructing sidewalks	R. C. Hill, City Aud.
Mont.	Plentywood	May	7..Dragging roads	B. H. Johnson, Co. Clerk.
S. D.	Huron	1 p.m., May	7..10,000 sq. yds. hard surface pavement	O. A. Ricker, City Engr.
N. Y.	Vernon	7 p.m., May	7..Street paving	W. G. Stone & Son, Engrs. Mann Bldg., Utica.
Conn.	New Haven	2 p.m., May	7..Paving with wood block, sheet asphalt and National	F. L. Ford, City Engr.
Ind.	Hartford City	2 p.m., May	7..Road construction	J. L. McGeath, Co. Aud.
Wis.	Madison	2 p.m., May	7..Paving 7 streets	City Engr.
Ind.	Fowler	1 p.m., May	7..4 gravel roads	Warren Mankey, Co. Aud.
Ind.	Angola	1 p.m., May	7..1 concrete and 2 stone roads	I. W. Pence, Co. Aud.
Ind.	Kokomo	May	7..Laying hard surface pavement, brick gutters and concrete curb and walks	Bd. of Public Works.
Miss.	Brookhaven	10 a.m., May	7..Improving 19.7 miles roads	C. F. Sherman, Engr., McComb, Miss.
S. D.	Spearfish	8 p.m., May	7..Construction of crosswalks, sidewalks, culverts and other concrete work during the year	J. M. Ramsay, Aud.
Ind.	Cannelton	noon, May	7..Macadam road construction	M. C. Conway, Perry Co. Aud.
Ind.	Greensburg	1 p.m., May	7..Road construction	John C. Barbe, Decatur Co. Auditor
N. Y.	Albany	1 p.m., May	7..Constructing highways in 24 counties	Edwin Duffey, State Highway Comr.
N. J.	Newark	3 p.m., May	7..Improving Franklin St., Belleville and Bloomfield; furnishing broken stone	F. A. Reimer, Co. Engr.
Miss.	McComb	10 a.m., May	7..19.7 miles road improvement near Brookhaven	C. F. Sherman, Engr.
Ind.	South Bend	11 a.m., May	7..Constructing cement road	A. F. Wolf, Co. Audr.
Ind.	Nashville	1 p.m., May	7..Stone or gravel road	Omer Morrison, Co. Audr.
Ind.	Spencer	1 p.m., May	7..Crushed stone road	S. M. Royer, Co. Audr.
Ind.	Franklin	2 p.m., May	7..6,260 feet of gravel road	J. C. Gregg, Co. Audr.
Ind.	New Albany	10 a.m., May	7..Township road	Emile Dupaquier, Co. Aud.
Ind.	Rushville	2 p.m., May	7..7,138 feet concrete road, cost \$51,685; 13,000 feet Glutrin macadam road, cost \$20,000	W. H. McMullin, Co. Aud.
W. Va.	Fayetteville	2 p.m., May	7..14.5 miles bit. macadam, concrete or asphalt concrete roads	T. F. Maloy, Engr., Landisburg
Pa.	Athens	5 p.m., May	7..4,700 sq. yds. concrete pavement and 1,000 cu. yds. excavation	C. W. Tidd, Boro Clerk.
Ind.	Versailles	1 p.m., May	7..Crushed stone road	J. F. Lochard, Co. Aud.
Ind.	Vernon	11 a.m., May	7..Stone road construction	G. J. Bernhardt, Co. Aud.
Ind.	Brownstown	1 p.m., May	7..Tarvia-macadam and gravel roads	Albert Leudtke, Co. Aud.
Ind.	Jeffersonville	10 a.m., May	7..Limestone macadam road	G. W. Stoner, Co. Aud.
Miss.	Hattiesburg	May	7..Constructing 50 miles of gravel road	R. M. Hendricks, Pres. Co. Supervisors.
Ind.	Rockport	3 p.m., May	7..Gravel or stone road	J. Frank Stocking, Co. Aud.
Ind.	Portland	10 a.m., May	7..Constructing gravel road	John Bonifas, Co. Aud.
Ind.	Williamsport	9 a.m., May	7..5,000 ft. of gravel road	D. H. Moffitt, Co. Aud.
Mont.	Culbertson	3 p.m., May	7..Dragging roads	Ben. H. Jonson, Clerk.
Ind.	Hartford City	2 p.m., May	7..Furnishing broken stone	J. L. McGeath, Co. Aud.
Tenn.	Mountain City	May	7..26 miles road work; \$200,000 available	County Engineer.
Ia.	Albia	5 p.m., May	7..Cement sidewalks during 1917	C. C. Atchison, City Clerk.
Pa.	N'hampton H'ghts	5 p.m., May	7..Constructing about 9,000 sq. yds. wood block pavement	F. H. Villie, Boro. Engr., So. Bethlehem, Pa.
N. J.	Morristown	2 p.m., May	7..County road improvement	Rd. of Chosen Freeholders.
Minn.	St. Paul	10:30 a.m., May	7..Curbing and paving a number of streets	H. W. Austin, Pur. Agt.
Wash.	Newport	2:30 p.m., May	7..Clearing, grubbing, grading and gravel surfacing	H. A. Sewell, Co. Engr.
Wash.	Goldendale	10 a.m., May	7..Constructing 6 miles highway	C. W. Borden, Co. Engr.
N. Y.	Long Island City	11 a.m., May	7..Cement sidewalks, wood block pavements, grading and setting curb	M. E. Connelly, Boro. Pres.
N. Y.	New Brighton	noon, May	7..2,400 sq. yds. bit. macadam and 500 sq. yds. Belgian block on sand	Engr., Bur. Engr.
Wash.	Port Orchard	noon, May	8..County road construction	F. B. Gore, Co. Engr.
Wash.	Mt. Vernon	May	8..Concrete and reinforced concrete pavement	W. E. Costello, Co. Engr.
Ind.	Vincent	May	8..43,000 sq. yds. brick pavement, 6 miles rolled stone roads and 5 1/2 miles gravel roads	Winn H. Reel, Co. Engr.
Conn.	Hartford	11 a.m., May	8..Furnishing 400,000 gals. road oil with 40% to 50% asphaltic base; 30,000 gals. road oil with about 65% asphaltic base and 30,000 gals. Dustoline or its equal	Board Contract & Supply
N. J.	Bound Brook	8:30 p.m., May	8..13,000 sq. yds. vit. brick pavement with appurtenances	John W. Reed, Boro. Clerk
Ill.	Springfield	11 a.m., May	8..27,367 ft. oiled earth pavement	State Highway Comm.

BIDS ASKED FOR

STATE	CITY	RECD UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Ala.	Linden	May 8..2½ miles gravel road; cost, \$10,000.	W. G. Keller, State Highway Engr., Montgomery.	
Ind.	Indianapolis	10 a.m., May 8..100,000 gals. road oil.	Park Comrs.	
N. Y.	New Brighton	noon, May 8..Repaving with old Belgian blocks.	Engr., Bur. of Engineering.	
Ind.	Kokomo	10 a.m., May 8..Two miles of gravel road.	W. L. Benson, Co. Aud.	
Ind.	Rochester	2 p.m., May 8..Constructing stone road.	E. A. Smith, Co. Aud.	
Ind.	Monticello	10 a.m., May 8..Macadam roads	A. G. Fisher, Co. Aud.	
Ind.	Kensselaer	2 p.m., May 8..Two stone roads	J. P. Hammond, Co. Aud.	
N. D.	Antelope	2 p.m., May 8..Ten miles road construction.	John McDougal, Clerk.	
Ind.	Brazil	10:30 a.m., May 8..Stone and gravel road	W. O. Graesser, Co. Audr.	
Ind.	Bloomfield	2 p.m., May 8..2 macadam roads	G. E. Kidd, Co. Aud.	
Ind.	Princeton	11 a.m., May 8..Constructing stone roads	J. H. Armstrong, Co. Aud.	
N. C.	Roxboro	May 8..Sand-clay road	M. R. Long, Co. Highway Commr.	
Ind.	Wabash	10 a.m., May 8..1 stone and 2 gravel roads.	F. P. Kircher, Co. Aud.	
Ind.	Peru	Noon, May 8..Macadam road	F. K. McElheny, Co. Aud.	
Ind.	Danville	10 a.m., May 8..Constructing three roads.	C. M. Havens, Co. Audr.	
Ind.	Salem	May 8..11,735 feet road construction.	E. E. Batt, Co. Audr.	
Ind.	Crawfordsville	10 a.m., May 8..Limestone and gravel roads.	Dr. W. F. Batman, Co. Audr.	
Wash.	Mt. Vernon	1 p.m., May 8..Concrete road construction	Co. Engr.	
Ind.	Washington	1 p.m., May 8..Construction of 2 gravel roads.	J. G. Clark, Davless Co. Aud	
Ind.	Vincennes	2 p.m., May 8..Construction of 7 gravel roads.	J. I. Muentzer, Knox Co. Aud.	
N. C.	Roxborough	May 8..Sand-clay road	M. R. Long, Co. Highway Commr.	
S. C.	Pickens	May 8..Sand-clay top soil road.	County Highway Comrs.	
Wash.	Wenatchee	May 8..Paving 1¼ miles with concrete.	F. M. Berry, Co. Engr.	
Ind.	Decatur	10 a.m., May 8..Construction of macadamized roads.	J. Mosure, Adams Co. Aud.	
Wash.	Mt. Vernon	May 8..2,200 sq. yds. one course concrete pavement.	Co. Comrs.	
Ind.	Washington	1 p.m., May 8..2 gravel roads	J. G. Clark, Co. Aud.	
Ind.	Marion	2 p.m., May 8..Stone and tar binder road.	Mort McRae, Co. Aud.	
Ind.	Martinsville	1:30 p.m., May 8..Gravel and stone roads.	Sam Watson, Co. Aud.	
Wash.	Shelton	4 p.m., May 8..Highway construction, cost \$13,684.	A. V. Meyer, Co. Engr.	
Wis.	Madison	2 p.m., May 8..Paving 10 streets	O. S. Norseman, City Clerk.	
Ind.	Bedford	1 p.m., May 8..14,300 feet gravel and macadam road.	Co. Aud.	
N. J.	Long Branch	May 8..Concrete paving on alley.	A. D. Sherman, City Clerk.	
Ill.	Sandwich	2 p.m., May 8..4,500 sq. yds. brick pavement and 2,100 ft. concrete curb.	Board of Local Improvements.	
Neb.	Omaha	10 a.m., May 8..Curbing and paving streets.	City Engr.	
N. D.	Fargo	May 9..71 miles highway construction.	W. R. Tucker, Co. Aud.	
Kan.	Hutchinson	May 9..Grading and gravelling.	W. B. Harris, Engr.	
O.	Cleveland	10 a.m., May 9..Grading and paving.	W. A. Stinchcomb, Co. Survr.	
Ind.	LaFayette	10 a.m., May 9..1.52 miles gravel road.	Geo. Baxter, Co. Aud.	
Ind.	Columbia City	Noon, May 9..Several gravel roads.	T. A. McLaughlin, Co. Aud.	
Ind.	Columbus	10 a.m., May 9..Road construction	W. H. Scott, Co. Aud.	
Wis.	Madison	2 p.m., May 9..Paving 20 streets.	O. S. Norseman, City Clerk.	
Miss.	Indianola	May 9..Construction of roads, gravel base with surface treatment of asphaltic macadam.	Stein & Harbert, Engrs., Distr. 2 and 3, Sunflower Co.	
Ill.	Danville	3 p.m., May 9..3 miles concrete or bit. concrete road.	W. S. Dillon, Co. Highway Supt.	
Ill.	Decatur	11 a.m., May 9..Oiling 27,000 ft. earth roads.	County Highway Supt.	
O.	Cleveland	noon, May 9..Grading, curbing and paving.	Comr. Engineering.	
R. I.	Providence	noon, May 9..12.9 miles bit. macadam and 1 mile cement concrete.	State Bd. Public Roads	
N. J.	Jersey City	2 p.m., May 9..Bit. concrete on macadam or stone foundation.	Co. Blvd. Comrs.	
Mich.	Albion	May 9..7,500 sq. yds. resurfacing.	City Clerk	
La.	New Orleans	noon, May 9..13.68 miles gravel road.	Duncan Buile, State Hwy. Engr.	
N. J.	Newark	3:30 p.m., May 10..Grading, curbing, flagging and paving.	M. R. Sherrerd, Chief Engr.	
N. J.	Newark	3:30 p.m., May 10..60,000 gals. non-asphaltic road oil.	M. R. Sherrerd, Chief Engr.	
Ark.	Texarkana	2 p.m., May 10..Constructing about 70 miles of highway, including 18 miles of road surface with either gravel, penetration asphalt, asphalt carpet coat or concrete, and remainder gravel surfacing	Sec. Miller Co. Hwy. & Bridge District City Clerk.	
Ill.	Witt	7:30 p.m., May 10..3 blocks brick pavement, 80-100 ft. wide.	R. S. Douthat, Co. Clk.	
W. Va.	Huntington	1 p.m., May 10..4.5 miles brick pavement.	Nisbet Wingfield, Comr. P. W.	
Ga.	Augusta	4 p.m., May 10..15,000 sq. yds. street pavement.	Edward Simon, Co. Aud.	
Ind.	Crown Point	1 p.m., May 10..Furnishing asphalt, broken stone and sand.	Fred A. Hausheer, La Porte Co. Auditor	
Ind.	La Porte	10 a.m., May 10..Construction of a number of roads.	A. L. Davis, City Engr.	
Conn.	Danbury	8 p.m., May 10..Concrete, Hassam, asphalt block or Amiesite, 10,360 sq. yds.	Robt. Horn, Engr.	
O.	Greenville	May 10..3,000 ft. curb and gutter and 500 sq. yds. brick pavement.	H. D. Good, Co. Aud.	
Ind.	Delphi	May 11..Cement construction and curbing.	City Engr.	
W. Va.	Bluefield	noon, May 11..Bit. macadam on coner. base, and curbs and gutters.	W. O. Horton, Hamilton, Co. Aud.	
Ind.	Noblesville	10 a.m., May 12..Constructing three roads.	F. M. Williams, Co. Aud.	
Ind.	Muncie	10 a.m., May 12..Gravel or macadam roads.	W. H. Hamlin, Co. Aud.	
Minn.	Pine City	May 12..Grading and culverts, cost \$6,000.	P. H. Connoll, City Engr.	
Wis.	Racine	10 a.m., May 12..2,500 cu. yds. grading.	L. L. Boyer, Highway Supt.	
Ill.	Quincy	2 p.m., May 12..1 mile gravel road.	City Clerk.	
Ore.	Huntington	8:30 p.m., May 14..5,070 sq. yds. paving.	N. M. Collier, City Engr.	
Neb.	Hastings	5 p.m., May 14..43,656 sq. yds. paving, curb and gutter, etc.	City Engr.	
Me.	Bangor	10 a.m., May 14..10,000 cu. yds. gravel; bit. macadam road.	Village Council.	
O.	Lewisville	May 14..Paving principal village streets.	B. B. Weber, City Engr.	
Pa.	Oil City	4:30 p.m., May 14..3,350 sq. yds. brick or concrete paving.	James Allen, State Hwy. Engr.	
Wash.	Olympia	May 14..Constructing 41 miles of state highway and 5 bridges.	L. K. Fesler, Marlon Co. Aud.	
Ind.	Indianapolis	10 a.m., May 14..Gravel road construction.	F. K. McElheny, Mia. Co. Aud.	
Ind.	Peru	noon, May 14..Gravel and concrete construction	W. F. Smith, City Clerk.	
Ind.	Lebanon	7:30 p.m., May 14..Sidewalk construction	C. M. Laurent, Boro. Clerk.	
N. J.	Moonachie	8 p.m., May 14..Curbs and gutters	City Engineer	
N. Y.	Watervliet	4 p.m., May 14..Concrete pavement construction	E. E. Allen, Supt. Streets	
N. Y.	Olean	8 p.m., May 14..Brick pavement with concrete foundation.	B. B. Weber, City Engr.	
Pa.	Oil City	4:30 p.m., May 14..Paving several alleys either with reinforced concrete or vitrified brick	W. S. Keller, State Highway Engr., Montgomery, Ala.	
Ala.	Utah	May 14..Grading and draining section of State Highway	F. F. Pressey, City Engr.	
Me.	Bangor	May 14..Macadam pavement	C. F. Blood, Engr., Broad Ave. Morsemere	
N. J.	Palisades Park	8 p.m., May 15..Street improvement, including concrete sidewalks, curbs and gutters	State Rd. Comr. Rd. of Pub. Wks.	
Md.	Baltimore	noon, May 15..1.18 miles concrete road; 66-ft. bridge.	G. W. Nicholls, Boro Engr.	
Ind.	Michigan City	10 a.m., May 15..Paving and cement sidewalks.	M. McMahon, Engr.	
Pa.	Sharnsville	5 p.m., May 15..8,352 sq. yds. brick pavement.	District Comrs.	
Wis.	Menasha	May 15..11,000 sq. yds. paving, 11,000 ft. curb and gutter. Paving to be concrete, asphalt or brick.	Board of Local Improvements	
D. C.	Washington	May 15..Asphalt block, brick, sewer brick, asphalt cement, portland cement, road oils, tars, paving pitch and sewer pipe for 1917.		
Ill.	Berwyn	8 p.m., May 15..Asphalt concrete pavement.		

BIDS ASKED FOR

STATE	CITY	RECD UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Ia.	Eldon	7 p.m., May 16	Grading, curbing and paving about 13,000 sq. yds. and 6,000 ft. concrete curb, either vitrified brick and brick block, concrete, asphaltic concrete or bitulithic on concrete foundation	H. E. Ritz, City Clerk Ed. of Pub. Wks.
Ind.	Indianapolis	10 a.m., May 16	Resurfacing three streets	Co. Comrs.
O.	Cincinnati	noon, May 18	Repairing county roads	Ed. of Supvs., Rd. Dist. No. 3, Houma, La.
La.	Terrebonne	11 a.m., May 19	Furnishing clam shell and tile	G. D. Robertson, Co. Engr.
Wash.	Montesano	May 21	11,666 ft. 18-ft. concrete road	E. S. Royer, City Engr
O.	Kent	Noon, May 21	9,000 sq. yds. first class pavement, probably Topeka, 8,000 ft. of curb, 10,000 sq. feet cement or asphalt sidewalk and 5,000 cu. yds. excavation	E. H. French, Co. Clerk
O.	Newark	May 22	Brick pavement	F. L. Gibboney, City Engr.
Va.	Roanoke	noon, May 24	Macadamizing, brick paving, concrete curb and gutter and granolithic sidewalks	C. A. Eichelberger, Co. Rd. Engr., Weilsburg.
W. Va.	Morgantown	2 p.m., May 24	15.5 miles brick, bit. concrete or macadam, concrete or macadam roads	A. P. Dettmann, Twp. Clk.
N. D.	Judson	May 25	Grading 8 miles of county road	A. M. Larson.
Mich.	Ingalls	May 25	Gravel or crushed stone roads	
SEWERAGE.				
O.	Centerburg	noon, May 4	2,400 ft. 8 and 10-in. sewers and disposal plant	Richards Engrs. Co., 37 1/2 E. Long St., Columbus
N. Y.	Fairport	8 p.m., May 4	8,000 ft. 10 to 27-in. storm sewers	C. F. Fisher, Engr.
Ill.	Gross Point	8 p.m., May 5	Sanitary sewer system	Village Clerk.
Ill.	Woodstock	11 a.m., May 5	5 miles 6 to 22-in. tile drains	C. L. Tryon, City Engr.
Minn.	Benson	10 a.m., May 5	91,000 ft. 5 to 26-in. tile drains	D. P. Carney, Co. Aud.
Pa.	Phoenixville	8 p.m., May 5	908 ft. 24-in. sewer	C. H. Keeley, Boro Clerk
N. Y.	White Plains	May 7	Sewer construction	Harvey Green, Clerk Board Supervisors
Pa.	Williamsport	10 a.m., May 7	Sewer-cleaning machine	Geo. K. Harris, Supt. of High- ways
O.	Huron	May 7	Sewer construction	F. H. McQuillen, Village Clk.
N. J.	Plainfield	8.30 p.m., May 7	Constructing sanitary sewers and appurtenances, includ- ing 6, 12, 16 and 18-in. vitrified pipe	A. J. Gavett, Engr., 151 North Ave.
Pa.	Coatesville	8 p.m., May 7	4,545 ft. 8-in. terra cotta sewer	City Engr.
O.	West Park	May 7	Storm and sanitary construction	F. Feuchter, Village Clerk
Neb.	Ogalla	5 p.m., May 7	Sewers; cost \$2,500	V. E. Warren, Vil. Clk.
Ont.	Welland	May 7	Covered concrete tile drain	Geo. Ross, Twp. Engr.
Neb.	Hebron	7 p.m., May 7	Sewer construction, cost \$1,700	Frank Boyle, City Clerk.
Minn.	Albert Lea	7:30 p.m., May 8	Sewer construction	C. J. Dudley, City Clerk.
Ill.	Sandwich	2 p.m., May 8	900 ft. 8 to 12-in. sewers	City Clerk.
Minn.	Cakota	8 p.m., May 8	Constructing sewers	G. A. Stenson, Vil. Red. Comr. of Engrg.
O.	Cleveland	noon, May 10	Sewers in several streets	City Clerk.
Ga.	Tennille	May 10	Four miles sewers, manholes and flush tanks	A. L. Davis, City Engr.
Conn.	Danbury	8 p.m., May 10	2,200 ft. 6 to 12-in. sewers	City Clerk.
Ore.	Huntington	8:30 p.m., May 14	Sewer system	Town Clerk.
Me.	Kennebunk	2 p.m., May 14	1,950 ft. 6-in. pipe sewers	E. E. Allen, Supt. Streets
N. Y.	Olean	8 p.m., May 14	Storm sewers and appurtenances	C. A. Culp, Pres., Drainage Dist., Latham, Ill.
Ill.	Decatur	11 a.m., May 15	Tile drains, including salt-glazed and hard-burned shale tile	G. A. Borden, Dir. Pub. Serv. County Aud.
O.	Columbus	noon, May 15	Sand catcher at sewage pumping station	District Comrs.
Ia.	Muscatine	2 p.m., May 15	4,250 ft. 16 and 18-in. tile	Bur. of Sewers, 215 Montague St.
D. C.	Washington	May 15	See Streets and Roads	
N. Y.	Brooklyn	11 a.m., May 16	Sewer construction; cost \$588,000	Sec. Malheur Drainage Dist.
Ore.	Ontario	noon, May 17	Constructing drainage system comprising 3 miles open drain and 60,000 lin. ft. treated wood blocks, cov- ered box	G. W. Olson, City Aud.
N. D.	Stanley	8 p.m., May 17	Sewer system	E. S. Royer, City Engr.
O.	Kent	Noon, May 21	2,500 feet 8 to 15-in. storm sewer	B. J. T. Jeup, City Engr.
Ind.	Indianapolis	10 a.m., May 22	Constructing sewer	County Aud.
Ia.	Fort Dodge	2:30 p.m., May 24	Tile drain; cost \$23,966	Town Clerk
Md.	Mt. Rainier	2:30 p.m., May 25	10 miles sanitary sewers	C. C. Chatterjee, Sec. Corp. of Calcutta.
India	Calcutta	2 p.m., June 1	Storm water pumping plant	
WATER SUPPLY.				
O.	Cleveland	Noon, May 4	Installing water main at swimming pool	Park Engr.
O.	Cleveland	noon, May 4	Seventy tons lead pipe	Comr. of Water.
Fla.	Jacksonville	4 p.m., May 4	Steam driven wet vacuum pump	Bd. of Bond Trustees.
O.	Martins Ferry	May 5	Constructing well system, suction pipe line, pumps, etc.	T. McPherson, City Clerk
Ont.	York	noon, May 5	Trenching, laying, jointing and testing 39,000 ft. 12 and 24-in. mains; 100 tons pig lead	Frank Barber, Twp. Engr., Toronto, Ont.
Minn.	Ada	7 p.m., May 7	Connecting water mains for 1917	Peter Sharpe, City Clerk.
N. D.	Grand Forks	4 p.m., May 7	Constructing water main	W. H. Alexander, City Aud.
N. C.	Ft. Caswell	11 a.m., May 7	Constructing 9,520 feet submerged pipe line	Quartermaster.
N. J.	Bloomfield	8 p.m., May 7	20 tons 8-in. c. l. water pipe, 17 tons 6-in. c. l. water pipe and 2 tons specials	E. Baechlin, Town Engr. City Audr.
N. D.	La Moure	8 p.m., May 7	Waterworks constructions	W. H. Turbitt, City Clerk.
Wis.	Prairie du Chien	7 p.m., May 7	Drilling 8-in. well	A. D. Hagenstein, City Aud.
N. D.	Minot	8 p.m., May 7	Drilling 10-in. well	Comr. Water Supply, Gas and Electricity.
N. Y.	New York	2 p.m., May 8	Chloride of lime and chlorine gas	Comr. of Water.
O.	Cleveland	noon, May 8	30 and 36-in. riveted steel pipe	F. W. Findsen, City Clerk.
Minn.	Staples	8 p.m., May 8	Construction of reinforced concrete reservoir; capacity, 200,000 and connections	A. H. Fasel, City Clerk.
Minn.	Thief Riv. F's	8 p.m., May 8	Concrete reservoir, 2 pump houses, 6-in. pipe line, deep well pump and motor	Board Water Comrs.
N. Y.	Cortland	2 p.m., May 9	Constructing pumping station and chimney and furnish- ing one 4,000,000 g. p. d. high duty pumping engine	Town Clerk
Neb.	Harrison	May 9	Pumping plant	City Clerk.
Ga.	Tennille	May 10	Hauling and laying 3,600 ft. 6 and 8-in. and 10,560 ft. 1 1/2 and 2-in. water pipe. City furnishes pipe	
N. J.	Ogdenville	8 p.m., May 14	Water works system, laying 19,000 ft. c. l. pipe, valve and hydrant setting, trenching, etc., and furnishing 1,500 ft. agricultural drain tile	W. N. Harris, Boro. Clerk D. A. Miller, Clerk.
Ia.	Milton	May 14	Water supply system; cost \$18,000	W. R. Reynolds, Power House.
Ont.	Listowel	2 p.m., May 16	150,000-gal. concrete reservoir	Arthur Geisler, Engr., Rebolt Bldg., Dayton.
O.	Dayton	noon, May 16	Motor pumping machinery, pipe, etc., at tuberculosis hos- pital	It. E. Weant, Pres., Warm Springs Irrigation District
Ore.	Vale	May 16	Concrete gravity type dam	

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
N. D.	Stanley	8 p.m., May 17	Waterworks system	G. W. Olson, City Aud.
Md.	Mt. Ranier	2.30 p.m., May 25	10 miles 4-in. and 8-in. water mains, pumping station and steel tank and tower	Town Clerk
MISCELLANEOUS.				
Wis.	Milwaukee	10.30 a.m., May 4	Two portable crushed stone loaders	F. G. Simmons, Comr. P. Wks.
Minn.	Mountain Iron	8 p.m., May 4	Smoke stack at power plant	Evor Mattson, Vil. Recorder.
Ill.	Springfield	May 7	125,000 ft. fibre duct for conduits	City Clerk.
Minn.	South St. Paul	8 p.m., May 7	600 to 1,000-gal. oil sprinkler and wagon	City Clerk.
N. J.	New Brunswick	10 a.m., May 8	Constructing 15-ton garbage incinerator	Asner Atkinson, City Engr.
O.	Elyria	noon, May 9	Collection and disposal of garbage	M. M. Wilcox, Dir. Pub. Serv.
D. C.	Washington	2 p.m., May 10	Furnishing drag line excavators	U. S. Reclamation Service.
Mo.	St. Charles	2 p.m., May 14	Ditch excavation, culvert work, etc.	Alfred Kiske, Engr., 1st Natl. Bank Bldg.
Wyo.	Sheridan	10 a.m., May 14	Furnishing machines and sprinkling streets	T. A. Morris, City Clerk.
N. Y.	Dunkirk	May 15	Constructing and paving dock	W. H. Shelton, City Engr.
N. J.	Trenton	May 15	Dredging section of proposed inland waterway	State Board of Commerce and Navigation
Mich.	Detroit	May 17	38 tons of iron and steel for pier construction	U. S. Engineer Office.
N. J.	Milburn	8 p.m., May 21	Collection and disposal of ashes, garbage and rubbish, etc. for 2 years	N. R. Silance, Township Clk.
Minn.	Ivanhoe	4 p.m., May 22	Grader with 12-ft. blade	K. A. Hansen, Co. Aud.
S. D.	Clear Lake	2 p.m., May 22	Drainage ditch, requiring 130,000 cu. yds. excavation	J. M. Wold, Co. Aud.

STREETS AND ROADS

San Diego, Cal.—City to let contract in May for paving La Jolla Blvd., Prospect Pl. and other streets, including 413,419 sq. ft. 4-in. concrete and 2,057 lin. ft. cement curbs, etc. G. Cromwell, City Engr.

Santa Rosa, Cal.—City plans to pave 4th St., Topeka, with asphalt or concrete, including cement curb and storm drain. R. R. Smith, City Engr.

West Frankfort, Ill.—City plans to build 10 miles of concrete sidewalks and 7 miles of hard roads. Putnam & Mantz, Benton, Engrs.

Bloomington, Ind.—Monroe county highway bonds to amount of \$8,500 were sold to Breed, Elliott & Harrison, of Indianapolis, for \$115 premium.

Columbus, Ind.—Bartholomew County highway bonds, \$5,800, 4 per cent., ten years, were sold to John Taylor, of Columbus, Ind., for \$40 premium.

Crownpoint, Ind.—Bids received May 9, 1917, at 10 a. m., by treasurer of Lake county, for sale \$26,000, \$8,000, \$6,000 and \$15,000 highway improvement bonds, 4½ per cent. M. J. Brown, Treasurer.

Kentland, Ind.—Newton county highway bonds, an issue of \$5,300 4½ per cent., ten years, were sold to the Salem Bank, of Goshen, Ind., for \$106 premium.

Kokomo, Ind.—Petition presented to council for the improvement of Wabash Ave., from Markland Ave. to Foster St.

Madison, Ind.—Two issues Jefferson county highway bonds were sold to the Salem Bank, of Goshen, and the Madison Safe Deposit & Trust Co., of Madison, the former securing an issue of \$14,090 for a premium of \$292 and accrued interest, and the latter an issue of \$17,450 for premium of \$296.60 and accrued interest.

Mt. Vernon, Ind.—Bids received May 8, 1917, at 2 p. m., by treasurer of Posey county, for sale \$39,200 and \$9,600 highway improvement bonds, 4½ per cent., 20 and 10 years, respectively. Geo. J. Ehrhardt, Treasurer.

New Albany, Ind.—Bids received May 7, 1917, at 10 a. m., by treasurer of Floyd county, for sale \$9,680 highway improvement bonds, 4 per cent. Claude A. Sittason, Treasurer.

Princeton, Ind.—Bids received May 15 at 3 p. m., by treasurer of Gibson county, for sale \$10,800, \$18,000, \$4,200, \$19,200 highway improvement bonds, 4½ per cent., ten years. D. H. Swan, Treasurer.

South Bend, Ind.—Wild & Co., of Indianapolis, offered the highest premium on the \$27,500 road bonds sold by County Treasurer Edward E. Keller. Premium amounted to \$337.50. Bonds were for the improvement of the H. F. Curtis Rd. in Penn township, running 10 years. Other bidders were: Dolins & Co., Indianapolis, \$332.75; Merchants Bank, Muncie, Ind., \$306; Fletcher National Bank, Indianapolis, \$220; Breed, Elliott & Co., Indianapolis, \$216.

South Bend, Ind.—Common council appropriated \$25,000 to streets and alleys fund, to be used for the improvement of the street intersections in various portions of the city.

Terre Haute, Ind.—Bids received May 5, 1917, at 10 a. m., by treasurer of Vigo county, for sale \$3,300 highway improve-

ment bonds, — per cent., 10 years. Everett E. Messick, Treasurer.

Fort Wayne, Ind.—Bids received May 14, 1917, at 10 a. m., by treasurer of Allen county, for sale \$2,400 highway improvement bonds, 4½ per cent., 10 years. W. F. Ranke, Treasurer.

Valparaiso, Ind.—The issue of bonds for the J. R. Wilson gravel road, Porter county, in the amount of \$15,000 were sold to the Farmers National Bank of Valparaiso, at a premium of \$170.

Versailles, Ind.—May 7, 1917, at 12 M., by treasurer of Ripley county, for sale \$3,900 highway improvement bonds, 4½ per cent., ten years. George T. Beckett, Treasurer.

Bettendorf, Ia.—City planned to pave five blocks of 10th St. West this summer. Water mains will be laid by water company. Sixth St. East, Main St., Central Ave. and all the streets in Riverside addition, which adjoins the east limits of the city of Davenport, will be brought to grade. The administration of Bettendorf has retained Nat H. Tunncliffe, of Davenport, as consulting engineer, and he is at work now on plans for grading and paving work.

Hutchinson, Kan.—Resolution to pave 2 miles of city's streets introduced at meeting of city commission; calls for the grading, curbing, guttering and paving of Washington St., from 18th to 19th, one block; 18th St., from Main St. to Adams, two blocks; Adams St., from the alley north of 2d Ave. to 23d St., 20½ blocks; total, 23½ blocks. In the resolution was a clause providing for the curbing of Madison St. between 11th and 13th Sts., and Bigler west from Main to Adams St.

Princeton, Ky.—Caldwell county will vote May 26 on issuing road bonds for \$225,000.

Kenner, La.—From Hanson City to Kenner a gravel road approximately a mile and a half will be constructed. The city has purchased a tractor, which will be used in connection with all the road improvement work.

Frederick, Md.—County commissioners decided to repair Buckeystown pike, recently purchased by the state. Road commission will be consulted and asked to have its engineers to recommend the best method for securing temporary improvements. The road will in all probability be oiled.

Attleboro, Mass.—Finance committee recommended to city council an appropriation of \$18,000 for widening and rebuilding Union St. from Park St. to Dunham St., and \$6,000 for rebuilding Park St. from Union St. to Pine St. Streets will be constructed with the asphalt penetration method.

Beverly, Mass.—Alderman Irving presented an order authorizing the consideration of continuing the resurfacing of Water St. E. to Maple St.

Battle Creek, Mich.—City commission petitioned for sidewalks as follows: On the north side of Michigan Ave., from Maple to Cherry St.; south side of Harrison St., to Burnham St., and on the north side of Prairie Ave., from Fairhome addition to Foster Ave.

Battle Creek, Mich.—City commission asked for improvements to Liberty and Eldred Sts., cement curb and gutter; Husey St., graded.

Grand Rapids, Mich.—James Schriever, city clerk, receiving bids May 5, 3 p. m., for \$250,000 4½ per cent. street improvement bonds, dated Aug. 1, 1916: \$50,000 due Aug. 1, 1917; \$50,000 due Aug. 1, 1918; \$50,000 due Aug. 1, 1919; \$50,000 due Aug. 1, 1920; \$50,000 due Aug. 1, 1921.

Holly, Mich.—The county road campaign for Holly and surrounding vicinity for the coming season includes the completion of the Holly-Milford Road and the road leading through Olive Branch and to the old turnpike north of Springfield village. The more direct of the two will be by way of East Maple St. in Holly and the old turnpike to Pontiac.

Marquette, Mich.—Onota township and Alger county will build a first class automobile road along the northern part of Alger county and along the shore of Lake Superior to the Marquette county line, with the exception that Marquette county will connect the road with present routes on this side of the line. The road will have its beginning at Au Train and will continue to the Marquette county line to a place about two miles south of Sand River. In order to connect with Marquette county roads, about 5 miles of roadway must be built through ideal conditions. The proposed route passes through a cut over section of gravel with a mixture of clay soil. This material makes first class road material.

Pontiac, Mich.—The city engineer was directed to prepare plans, profile and estimate for construction of a pavement south of the D. U. R. tracks on West Huron St. from the end of the present pavement to Waldo St., the cost to be borne by the Seminole Hills Co. It is not the city's intention to pave the north side of the street until next year.

Chisholm, Minn.—Council authorized construction of sidewalks and curbing on a total of 25 blocks of thoroughfare and paving five blocks of street estimated to cost approximately \$30,000 and comprising what is expected to be the total expenditures of the village on street improvements this year, as follows: Central Ave., Brick to Spruce St.; Hemlock St., First to Second Ave.; Fourth Ave., Lake to Chestnut St.; First Ave., Walnut to Elm St.; Curbing, Poplar St., Central to First Ave., both sides; Third Ave., Hemlock to Poplar St., both sides; Elm St., Second to Third Ave., both sides; Elm St., Fourth to Fifth Ave., south side; Walnut St., Fifth to Seventh Ave., both sides; Pine St., Fifth to Seventh Ave., both sides; Fifth Ave., Walnut to Elm St., both sides. Sidewalks, Poplar St., Central to First Ave., and Second Ave. to West line; Third Ave., Hemlock to Oak St.; Spruce St., Swan River railroad to Second Ave.; Birch St., Central to First Ave.; Elm St., Second to Fifth Ave.; Fourth Ave., Walnut to Elm St., on both sides of street, and Oak St., depot to Second Ave., on south side of street.

Glenwood, Minn.—County plans to spend \$30,000 building roads during year.

Minneapolis, Minn.—Frank W. Cook, County Commissioner, announced very little road construction will be done in Hennepin County this year. Practically all of the \$251,000 available will be used in dragging roads, filling holes, oiling work and other road maintenance.

Funds raised by special Hennepin County legislation that passed the 1917 Legislature will not be available for road work until 1918 and 1919.

Joplin, Mo.—Business men of the town have agreed to undertake the building of a concrete road about 30 miles in length from this town to Miami, Okla., and have it completed within 18 months at cost about \$500,000, of which Joplin plans to raise \$100,000.

Hinsdale, Mont.—Chamber of Commerce has launched a movement to permanently do away with impassable roads by graveling the roads in this district.

Livingson, Mont.—Present plans of the Park County board of commissioners call for the expenditure of approximately \$50,000 on the highway between this city and Gardiner, the official entrance to the Yellowstone National Park.

Grand Island, Neb.—City council will receive sealed bids for \$50,000 of district paving bonus of Paving Dist. No. 20; 8 p.m., May 2. H. E. Clifford, city clerk.

East Orange, N. J.—Ordinance approved for the laying of a concrete sidewalk on both sides of Olive St., between Prospect St. and the Bloomfield town line. Worrall F. Mountain, Mayor.

Garfield, N. J.—Council received petition asking Riverside Pl. be graded, curbed and flagged.

Garfield, N. J.—City council passed resolution appropriating \$6,100 for securing the lanes necessary to widen and straighten Midland Ave.

Paulsboro, N. J.—City plans to build macadam roads. W. H. Flowers, Jr., city treasurer.

Salem, N. J.—Federal aid fund appropriated \$39,000 for road from Sharps town to Woodstown. A. Keasby, engr. in charge.

Trenton, N. J.—Horace E. Fine and S. E. Kauffman, state consul and associate state consul, respectively, of the Lincoln Highway in New Jersey, appeared before the State Highway Commission and Gen. George W. Goethals to advocate improvement of that section of the Lincoln Highway in this state, particularly between New Brunswick and Kingston.

Trenton, N. J.—Ordinance approved by Mayor Fred K. W. Donnelly for Board of City Commissioners and Board of Chosen Freeholders of Mercer County to enter into an agreement for the paving of Brunswick Ave. from Paul Ave. to the city line with sheet asphalt on a 5-in. concrete base. Leon D. Hirsch, City Clerk.

Ventnor City, N. J.—The Ventnor City National Bank was the successful bidder for the paving bonds to the amount of \$50,000.

Auburn, N. Y.—City council directed city engineer to prepare curb and sidewalk grade lines in Hunter Ave. for a distance of 300 ft. south of East Genesee St.

Cooperstown, N. Y.—Board of village trustees voted to pave and curb Nelson Ave. from Lake St. to the entrance of the Delaware & Hudson station.

New Rochelle, N. Y.—City council received estimates of cost from the department of public works and ordered referred to the committee of the whole: For laying penetration macadam on Adam St., from Homestead Park line to Rochelle Park Blvd. cost \$3,690. Laying penetration macadam on Badeau Pl., from Washington Ave. to Union Ave., cost \$2,000. Laying penetration macadam on 3d St. from Lafayette Ave. to New Haven Railroad, cost \$1,500. Grouting brick pavement in Homestead Park and work incidental thereto, cost \$350. Elimination of valley gutters at Washington Ave. and Warren St., cost \$750. Laying of suitable pavement on Webster Ave. from Lockwood Ave. to Winyah Ave., including the area of the Westchester Electric Railroad Co.; would recommend that the bricks be turned on their flats, grouted and a bitulithic or similar surface treatment be used; approximate cost \$10,000, of which the railroad share would be \$2,850. Necessary repairs to brick pavement on Washington Ave. from Charles St. to Webster Ave., including the trolley share; cost \$2,400 of which the railroad share will be \$725. For Washington Ave. from Webster Ave. to 6th St. penetration macadam would be advisable, at a cost of \$7,000. Construction of sewer on Winyah Ave. from Pelham line to Webster Ave.

New Rochelle, N. Y.—Council appropriated \$4,000 for completing the work of improving the new Griffin Park at Franklin Ave. and Cedar Rd.

New Rochelle, N. Y.—City council appropriated \$450 for putting in condition

the pavement at Echo Ave. and Cedar Rd.

Rome, N. Y.—Common council accepted bid of the Rome Trust Co. for the paving bonus, amounting to \$38,948.13, at par, 4 per cent and accrued interest.

Rome, N. Y.—Common council approved City Engineer Plunkett's estimates for paving of several streets: N. George St., Linden to Sycamore, brick, \$19,967.65; asphalt or bitulithic, \$19,279.04; railroad area, \$254.60. Depeyser, E. Whitesboro to Lawrence Sts., brick, \$7,600.70; asphalt or bitulithic, \$7,455.55. Linden, George to Madison, brick, \$8,073.18; asphalt or bitulithic, \$7,751.48; railroad area, \$2,546. N. Jay, Embargo to Elm Sts., brick, \$21,794.34; asphalt or bitulithic, \$21,089.82. Expense, Dominick to Thomas, brick, \$17,867.20; asphalt or brick, \$17,273.65; railroad area, \$7,638.

Watertown, N. Y.—Common Council was requested to appropriate \$240 for the reconstruction of concrete walks in Brainard St. not conforming to grade, and \$125 for the construction of walks in Holcombe St.; also to vote \$200 for repairs to Davidson St. between Phelps and West Hoard Sts., and \$50 for repairs to West Hoard St.

Watertown, N. Y.—Petition of property owners in South Meadow St. for a curb and gutter between West Mullin and Pine Sts. Referred to committee.

Asheville, N. C.—City commissioners sold an issue of \$35,000 street improvement bonds to Seasongood & Meyer of Cincinnati at a premium of four and seven-eighths or \$35,375. The issue is a part of \$90,000 for street improvements made last year. The remaining \$55,000 will be offered for sale within the next 60 days.

Whiteville, N. C.—City plans to pave 2 miles streets. W. E. MacDonald, clerk.

Winston-Salem, N. C.—Petition to widen 15th St., between Liberty St. and Woodland Ave., was referred to the Street Committee.

Winston-Salem, N. C.—Board of Aldermen petitioned to have South Liberty St., between 1st St. and Washington Ave., and on Washington Ave. from Liberty to Main Sts., paved with permanent paving.

Winston-Salem, N. C.—City will pave with Belgian block Depot St., between the end of the present pavement near 5th St. to 7th St., and Chestnut St., between 5th and 7th Sts.

Mandan, N. D.—Roads constructed in Morton County during the coming year will be built by Thomas Terry, of this city, at the rate of \$175 a mile. All told, about 100 miles of roads will be built at a total cost of \$17,500.

Akron, O.—Residents of Richfield Twp. voted in favor of the \$1,000 bond issue for the paving of a string of road 2 1/2 miles long, which will complete the highway from Akron to Cleveland. Specifications call for a brick road 16 ft. wide. The contract will be let by the commissioners as soon as possible.

Akron, O.—Council passed ordinance for paving of N. Howard St. from Main St. to the Little Cuyahoga River bridge.

Akron, O.—The F. L. Fuller Co., of Cleveland, was the successful bidder for road improvement bonds to the amount of \$63,000. U. G. High, Clerk, County Commissioners.

Canton, O.—Council received petition asking for the paving of Collins Court, N. W., from 2d St. to 5th St., N. W., with brick.

Canton, O.—Council passed ordinance to issue \$10,000 bonds to pay for land bought by the city to open Belden Ave., N. E., from Tuscarawas St., E., to 2d St., N. E.; also for the issuance of \$8,600 refunding bonds. Measure authorized Service Director Starrett to enter into a contract with the East End Welfare Association regarding the opening of 6th St., N. E. The estimated cost of paving 12th St., N. W., from Clarendon Ave. to Wertz Ave., to meet paving the county will do on the road to Meyer's Lake was given as \$20,583. Of this the city would pay only \$3,547.

Canton, O.—City sold \$17,000 bonds to pave and improve Liberty Ave., S. E.

Cincinnati, O.—Ordinance passed for the issue of \$107,600 bonds for the expense of improving Jones St., Boudinot Ave. and other streets and avenues, by paving the roadway, etc.

Elyria, O.—City council urged by business men from East Broad St. for the construction of one or two cross walks between Washington and East Aves.

Ironton, O.—County commissioners decided to advertise for bids to build two miles of new turnpike, one mile at Bald

Knob and one mile this side of Arabia, to connect up two important roads.

Middletown, O.—County commissioners received estimates for the improvement of several sections of the Dixie highway first on the Middletown-Hamilton division from Gregory Creek, 3 miles north to Excello, Monolithic brick, \$84,700, the county's share being \$59,700; reinforced concrete, \$74,600, county share \$49,600. The Middletown and Franklin section north from the corporation line of Middletown, 3 miles, Monolithic brick, \$79,500, county share \$54,500; reinforced concrete, \$70,600, county share, \$54,600.

Youngstown, O.—Messrs. Farson, Son & Co., of New York, were the successful bidders for West Federal St. widening bonds to the amount of \$225,000.

Zanesville, O.—City council adopted report for paving of Forest Ave.

Zanesville, O.—City engineer instructed to make an examination of Convers Ave. between Sunset and Adair with regard to the advisability of laying sidewalks.

Zanesville, O.—County Engineer Strait has completed plans for the proposed continuation of the Frazeyburg road improvement. The commissioners will ask for bids on both tarvia bound limestone macadam and concrete. According to the plans the improvement is to be extended to a point 1,900 ft. beyond the intersection with cross road to Newark, just south of the Guller Ban Voorhis farm.

Holdenville, Okla.—The following townships will vote May 12 on the question of issuing road bonds: Bernard Twp., \$50,000; Dustin Twp., \$50,000.

Mangum, Okla.—City is considering two miles asphalt paving and the purchase of a motor truck.

Hood River, Ore.—Plans are under way for improving Railroad Ave. by the city council; owners will hard surface if city and county will grade.

Salem, Ore.—Common council plans to improve portion of Myers St. from the east line of Commercial St. to the west line of High St.; grade, constructing cement concrete curbs and paving. Earl Race, city recorder.

Doylestown, Pa.—City plans to improve various streets. About \$11,000.

Ebensburg, Pa.—County commissioners directed the county controller to advertise for bids for construction of the permanent road from Johnstown to Upper Yoder township, known as the Millcreek road. The road will be of brick, with concrete base, and will be 3.143 feet in length.

Erie, Pa.—Improvements, costing from \$200,000 to \$250,000, are proposed in the section now known as Lincoln Green. Ordinances have been passed authorizing the paving of 28th St. from Parade St. to the eastern city limits, East Ave. from 24th St. to the southern line, and Wayne St. from 24th to 31st Sts. Bids are being asked for eight miles of sidewalk and curbing in the district.

Harrisburg, Pa.—Harmonious action between Luzerne County and the State Highway Department in the improvement of roads in that county during the next two years was the keynote of a conference held between representatives from Luzerne and State Highway Commissioner F. B. Black. Tentative plans covering proposed road construction during this period was presented to the Commissioner, provided appropriations are made by the Legislature in sufficient amounts to carry on the work contemplated. Commissioner Black stated that in view of the present war conditions, the main arterial highways should have speedy attention and urged the co-operation of the local authorities to this end.

Harrisburg, Pa.—C. E. Ande, president of the borough council of Hughesville, Lycoming County, and others conferred with State Highway Commissioner Black relative to the improvements of the borough's main street. Length of the road approximates 4,640 ft.; foundation is in a fairly good condition. The commissioner stated that the matter was a state aid proposition and assured that the state highway department would be glad to make the improvements if requested to do so by the county commissioners, who, in conjunction with the borough, must pay 50 per cent of the cost of the proposed recommendation. Also promised to send an engineer to Hughesville to inspect the old base of this section of the road in order to ascertain whether or not it could be resurfaced satisfactorily.

Harrisburg, Pa.—Commissioners of Mercer county conferred with State Highway Commissioner Black in the in-

terest of road improvement in that section. They have in view the construction of a through road about 28 miles in length commencing at New Wilmington and extending through Mercer and Greenville to the Crawford county line, on Route 82. The proposition was made to the department that one-half of the cost of this construction would be borne by the county. Commissioner Black assured them that he would co-operate with them to the fullest possible extent.

Huntingdon, Pa.—City voted \$100,000 bonds for street paving.

Johnstown, Pa.—Council referred petition from residents of Derby St., between Franklin and Riddle Sts., for foot front paving with brick, on concrete base, to committee of the whole.

Johnstown, Pa.—Council passed ordinance for the widening of Butler alley, between Fairfield Ave. and Stackhouse St.

Oil City, Pa.—City commission council received petition and referred to City Engineer Weber and Arthur Burns, Supt. of Streets, from residents of the Eighth ward, asking that Hoffman Ave., between Plumer St. and Manning St., be paved and a grade established for permanent sidewalks and that the work be done during 1917.

Oil City, Pa.—City commission council passed an ordinance fixing the grade and providing for the grading, paving and construction of permanent sidewalks on Clark alley, from the south side of Harriott Ave. to the north side of Bishop Ave.

Cranston, R. I.—City Highway Department plan to provide for funds for remodeling of Narragansett Blvd. according to a plan suggested by the Edgewood Improvement Association.

Woonsocket, R. I.—Common Council adopted the resolutions appropriating \$25,000 to grade Victor, Laval, Richelieu and Latayette Sts.

Woonsocket, R. I.—The Common Council referred to the Finance Committee resolutions appropriating \$2,048.05 to be added to the Mill St. bridge extension appropriation, \$14,000 to macadamize Diamond Hill Road, from Rathbun St. to Dewey St., and to curb this highway from Social St. to Dewey St.

Woonsocket, R. I.—Board of Aldermen referred to the Finance Committee resolutions appropriating \$6,000 for paving with bitulithic pavement Snow St., from North Main St. to Pond St., and \$9,750 for paving with the same material Earl St., from Social St. to Mechanics Ave., and \$2,600 for asphaltizing Blackstone St., from Harris Ave. to Highland St.

Pittsburg, Tex.—Camp county will vote May 11 \$145,000 road bonds.

Vernon, Tex.—As a result of the disturbed conditions now existing the \$1,000,000 good roads bond election, which was to have been held May 19, has been postponed until the end of the war. It will then be ordered again. The proposal is to lay 120 miles of concrete road netting the county.

Buena Vista, Va.—City plans to build five miles road. C. L. Johnson, city engr.

Covington, Va.—City voted \$150,000 bonds to pave streets. J. H. Overholt, clerk.

Graham, Va.—City plans to resurface two miles macadam streets.

Bluefield, W. Va.—City plans paving work to cost \$50,000, bituminous macadam. H. O. Wiles, city engr.

Camas, Wash.—The United Contracting Co. will shortly begin work of paving seven blocks with bitulithic. Petitions are being circulated for hard surfacing of Third St.

Olympia, Wash.—The state highway board approved plans and specifications for the improvement of about 35 miles of state roads and the construction of three new steel and concrete bridges. Commissioner Allen was authorized to call for bids. Total cost will be in the neighborhood of \$200,000.

Spokane, Wash.—The city council approved plans for paving Main Ave. from Lincoln to Monroe Sts. and Monroe St. from Riverside to Main Ave., at an estimated cost of \$3,500. This will include paving in the triangular unpaved strip in Riverside Ave.

Walla Walla, Wash.—Pavement of the following streets was provided for by the city commission on April 18: Valencia, from Isaacs to Fierera; Howard, from Whitman to the intersection with Park. A petition for pavement of 4th, from Popular to Jones St., was filed.

Crandon, Wis.—Voters decided in favor of issuing \$120,000 road bonds. E. W. Mountain, County Clerk.

Moncton, N. B.—City plans to pave Albert and Foundry Sts. City Engineer, J. Edgington.

Aylmer, Ont.—Town council will be in the market soon for crushed stone to repair roads. D. C. Davis.

Blenheim, Ont.—The town council plans to lay cement sidewalks. Clerk, P. S. Shillington.

Dutton, Ont.—For construction of boulevards and curbs, J. D. Blue has been authorized to prepare a by-law.

Guelph, Ont.—City will have a 4-ft. sidewalk constructed on the west side of Stevenson St., from Ferguson St. to the C. P. R. tracks. F. McArthur, city engineer.

Leamington, Ont.—The town council will widen Mill St. from 22 ft. to 27 ft. and lay 4-in. water main. Clerk, R. M. Seikirk.

Sarnia, Ont.—A petition is being circulated to have Lochiel St. and the block surrounding the new model school paved. City Engineer, John A. Baird.

Sarnia, Ont.—City council decided to pave the London road, at an approximate cost of \$25,375. City engineer, John A. Baird.

Sarnia, Ont.—Tenders will be called for the 1917 sidewalk and curb construction. City Engineer, J. A. Baird.

Tillsonburg, Ont.—Town plans to macadamize Ridout St. Clerk, A. E. Raynes.

Mount Lehman, B. C.—The Matsqui Council authorized the spending of \$1,700 on roads with the option of calling for tenders.

Quebec, Que.—Construction of a macadam or gravel road from Victoriaville to St. Angele de Laval considered by the Provincial Government. Minister Highway Dept., Hon. J. A. Tessier.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Birmingham, Ala.—County let contract 20 miles gravel road, including pipe culverts, to *Middleton & Smith, Brookhaven, Miss., \$37,941.

Birmingham, Ala.—City commission, on recommendation of City Engineer Julian Kendrick, awarded *H. N. Bowdry contracts for street paving, sheet asphalt, aggregating \$27,752.90. The work will include the paving of 19th St., north, Huntsville road, 14th court to 18th St., north; 16th St., from 18th St. to 19th Ave., which work will cost \$17,386.50; North 22d St., from Fifth to Eighth Ave., cost \$10,386.40.

Fresno, Cal.—Board of trustees awarded April 16 contract to *Thompson Bros. at \$15,490, for improving Madison Ave. sidewalk, grading and curbing. W. H. Ryan, City Clerk.

Fresno, Cal.—Board of trustees awarded April 16 contract to *California Road & Street Improvement Co., curb and gutter for Mariposa St. Cement concrete curb, per lin. ft., 39 cts.; cement concrete gutter, per sq. ft., 14 cts. W. H. Ryan, City Clerk.

Fresno, Cal.—Board of trustees awarded April 16 contract to *Thompson Bros. at \$500, for construction of an artificial stone sidewalk 5 ft. in width on and along each side of Inex St. from the south line of Tulare Ave. to the north line of Kern Ave. W. H. Ryan, City Clerk.

Palo Alto, Cal.—City let to *P. Coldwell, San Francisco, at \$142,000, paving 7-mile concrete road.

San Diego, Cal.—Common Council awarded *Olof Nelson, sidewalk improvements, as follows: Washington St., University Ave. and Mississippi St., 4th and Ohio Sts.

San Diego, Cal.—The *C. L. Hyde Construction Co. of this city has been awarded a contract to construct 9 miles of road beginning at the intersection of the state highway at the summit of the grade at Buckman's Springs and extending up the Laguna Mountains to the Laguna Lakes, was awarded by the United States Forest Reserve to afford access to the summer camp to be located at the lakes.

Tampa, Fla.—Board of public works awarded contract for approximately 6,000 lin. ft. of concrete curb, which is to be laid immediately on streets about to be paved. *A. C. Proudfoot bid 33 cts. per ft. on straight work and 38 cts. per ft. on curved work.

Canton, Ill.—Contracts for grading state aid road, sections L, M and N, in Fulton county, awarded to *Buis & Olson, of St. Joseph, Mo., for \$7,814.95. The location and price of each section is as follows: Section 14, Banner township, 4-

406 ft., \$2,746.59; section M, Manley east, 7,900 ft., \$2,798.93; section N, Duncan Mills west, 4,400 ft., \$2,269.43.

Springfield, Ill.—The following state-aid contracts were awarded by the State Highway Commission on April 19, 1917: Calhoun County, Sec. C, Route 1, waterbound macadam, *C. Madison Williams, 1908 N. Grand Ave., St. Louis, Mo., \$3,076.15; Will County, Sec. 1, Route 24, and Sec. F, Route 25, waterbound macadam, J. C. Poll, Danville, Ill., \$29,000; Will county, sec. D, Route 8, gravel, *Bland & Ferguson, Cairo, Ill., \$16,133.35; Pope county, Sec. C, Route 1-5-3, bridge, *J. M. Groves, Dixon Springs, Ill., \$2,400; Wabash county, Sec. C, Route 1, gravel, *Hoffman, Townsend & Co., Mt. Carmel, Ill., \$5,605.82; Jersey county, Sec. E, Route 3-2-2, bridges, *M. C. Robinson, Girard, Ill., \$2,190; Fulton county, Sec. O, Route 17-18-6, bridges, *Dan Alford, Cuba, Ill., \$3,019; Fulton county, Sec. L, Route, earth, *Buis & Olson, St. Joseph, Mo., \$2,746.59; Fulton county, Sec. M, Route 16, earth, *Buis & Olson, \$2,798.93; Fulton county, Sec. N, Route 11, earth, *Buis & Olson, \$2,269.43.

Greencastle, Ind.—Successful bidders for Putnam county road contracts are as follows: *A. G. Day, Greencastle; *Allen & Lisby, Greencastle; *Blue & Hill, Cloverdale; *B. F. Vaughan, Cloverdale.

Kokomo, Ind.—Board of Pub. Wks. to *L. F. Record, at \$2,850, for constructing sidewalks on Buckeye St., from Firmin to Hoffer St.

New Albany, Ind.—Floyd County Commissioners, at their meeting of April 21, awarded the contract for construction of 7,700 ft. road improvement in New Albany Twp. to *S. T. Games, of New Albany, Ind., for \$12,700.

Terre Haute, Ind.—*M. C. Lloyd & Son, of Farmersburg, Ind., will construct a gravel road for Vigo county at a cost of \$2,500.

Marshalltown, Ia.—City council awarded to *Western Construction Co. 31 blocks of concrete pavement: \$1.57 per sq. yd. for pavement; \$3.25 per sq. yd. for pavement in the street car track; 45c a ft. for curbing, and 60c per cu. yd. for extra grading.

Sioux City, Ia.—City council opened bids for street paving: Hanlon & Oakes, Sioux City and Minneapolis paving contractors, bid for the repaving of Douglas Pierce, Nebraska and 5th Sts., with concrete, at \$1.85 per sq. yd.; also for paving of Jones, Jennings and 32d Sts., at \$1.41.

Sioux City, Ia.—City awarded *Julius Overson for paving Jones, Jennings and 32d Sts. Concrete probably will be the material.

Lawrence, Kan.—City commission has awarded to *A. R. Young Construction Co., of Lawrence, paving with asphaltic concrete on a concrete base, Elm, Winona, Illinois from Eighth to Fourth Sts., 13th St., east to the city limits. The lowest bid on this kind of paving was \$1.57.

Madisonville, Ky.—County let contract building two miles road, macadam, to *W. E. Stone, Madisonville, \$13,355.

Boston, Mass.—Contract for the building of an archway and iron gateway for the Greeting, which will provide an attractive entrance to Franklin Park, has been awarded to the Cambridge Cement Stone Co. at \$21,850. This work, being carried out by the park and recreation department, will be finished by midsummer. The city council recently appropriated \$25,000 for it.

Lowell, Mass.—City council approved a contract between Charles J. Morse, commissioner of streets and highways, and *Daniel T. Sullivan, for 1,500 barrels of Portland Lehigh cement, at \$2.38 a barrel.

Lowell, Mass.—City council approved contract between the city and the *Hildreth Granite Co., of Boston, for 50,000 granite paving blocks at \$45.90 a thousand. These blocks are from 6 to 12 ins. in length, 4½ ins. in width and 4 ins. in depth.

Lowell, Mass.—City council awarded contract to *L. P. Palmer & Sons, of Graniteville, for 500 ft. of circle stone and 5,000 ft. of edgestone for the street department. The price of the circle stone is 68 cts. per lin. ft., and the edgestone, 50 cts. per lin. ft.; also approved a contract between the city and *Edward Cawley for 10,000 ft. of Portland cement pipe, D. and W. S. brand.



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EAST JERSEY PIPE CORPORATION

Fulton and Church Streets, New York City

Works: Paterson, N. J.

Newark, N. J.—Council approved the Imhoff system of sewage disposal, recommended by the sewer committee of the North Arlington Borough Council. The tank is to be installed at the foot of Gard Ave., east of Schuyler Ave., and will accommodate the sewage east of Kearny Ave. The west side of the avenue is to be sewered through the Passaic Valley trunk. The tank, it is estimated, will cost approximately \$8,000 and the mains, which will be built from Belleville turnpike, including the digging, will cost probably as much more. Thos. F. Bowe, an expert hydraulic engineer of East Rutherford, was authorized to prepare plans and specifications, which will be submitted to the State Board of Health. If they should be approved a special election will be held to determine how the money is to be raised.

Auburn, N. Y.—City council directed the committee on drains and sewers to investigate the conditions of the sewer in front of Nos. 47 and 47½ Park Place, and report with recommendations, at the next meeting.

Jamaica, L. I. (N. Y.)—Town Board of Borough of Queens will consider construction of more sewers, as follows: Idaho St., Joslin St. and Kendall Pl., from Queens Ave. to Franconia Ave., Flushing; Beekman St., from State St. to Mitchell Ave., Flushing; Colby St., from Oxford Ave. to Portland Ave., Woodhaven, and Woodhaven Ave., from Ashland St. to a point 1,400 ft. north, Woodhaven.

New Rochelle, N. Y.—See "Streets and Roads."

Watertown, N. Y.—Common Council has fixed May 18 for a public hearing on the proposed sewer extension through Howk, Newel and Lepper Sts.

Yonkers, N. Y.—City Engineer Fulton, submitting plans and specifications for constructing a sewer in Midland Ave. from Midland Ave. 800 ft. northerly; in Lee Ave., between Sanford St. and McLean Ave., and a house and storm water sewer in Lee Ave. from Sanford St. 1,400 ft. northerly. Referred to committee on public works.

Canton, O.—City sold \$77,000 bonds to install central southwest storm sewer.

Portsmouth, O.—To extend and improve sewerage system, city plans to issue \$10,000 bonds.

Leetonia, O.—City rejected bids for sewerage disposal plant. Cost, \$45,000.

Heavener, Okla.—The proposition to issue \$50,000 sewer bonds was defeated.

Kingston, Okla.—At recent election the proposition to issue \$17,000 sewer bonds was defeated. I. N. Click, Town Clerk.

Erie, Pa.—Council sold to the Second National Bank of Erie \$200,000 worth of Mill Creek improvement bonds for par and accrued interest from May 1, only bid received on \$800,000 worth of the bonds. The sale will make \$290,000 available for the tube construction work, Finance Director C. L. Baker estimated, and this will be sufficient for this year.

Erie, Pa.—Council rejected the bid of John J. Doyle for construction of a sanitary sewer in 28th St., Brandes St., 330 ft. east, because it exceeded the engineer's estimate of \$120. Was the only bidder and offered \$960 compared with an estimate of \$860. Engineer Lynch was directed to readvertise for bids, to be opened May 4.

Harrisburg, Pa.—Council passed ordinance authorizing construction of a terra cotta pipe sanitary sewer in Lenox St. from 19th St. to a point 25 ft. west of the eastern city line, and the construction of a terra cotta pipe sewer in a street 40 ft. wide between Jefferson St. and 7th St. from the sewer in Schuylkill St.

Montreal South, P. Q.—See "Water Supply."

McAllen, Tex.—City plans issuing \$46,000 bonds for sewer and street improvements.

Abingdon, Va.—Plans installing sewerage and sewage disposal plant.

Spokane, Wash.—Holes school district has petitioned for new trunk and lateral sewers to cost \$40,000.

Spokane, Wash.—War's uncertainties caused the city council to postpone action on the proposed \$150,000 downtown intercepting sewer for one year.

St. Johns, N. B.—City council decided to construct a terra cotta sewer on Adelaide St. City Engineer, W. L. Murdock.

Hepworth, Ont.—The town council plans to construct a drainage system. Clerk, W. R. White.

Toronto, Ont.—Construction of a sewer on part of Belshaw Ave. recommended by R. C. Harris, Comr. of Works.

Longueuil, Que.—Town considering spending \$30,380 for the construction of sewers. A. Thurber, Mayor.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Rock Island, Ill.—Board of local improvements, Mayor William McConochie, opened bids for the construction of a 15-in. storm drain on 5th St. from 5th to 6th Aves. W. H. Bedell agreed to do the work for \$647 and P. F. Trenkensschuh for \$740.20. Mr. Trenkensschuh was the only bidder for the construction of a 42-in. storm drain on 46th St. from 9th Ave. to 8th Ave. His figure was \$4.95 per ft. for segment block, the entire job to cost about \$1,600.

Boston, Mass.—Mayor approved contract April 16 with A. Baruffaldi, at \$17,716.02, for pipe sewers and drains in North Beacon St., between Market and Cambridge Sts. Bids for work opened April 7.

Steffenville, Mo.—to H. K. Johnson, Kakoka, at \$42,700 for constructing drainage district.

Scottsbluff, Neb.—J. S. Schwartz, Colorado Springs, Colo., at \$26,250, for water works extension.

Brooklyn, N. Y.—The Adjax Drainage Construction Co., with a price of \$12,473, for the construction of a temporary automatic electric pumping station at Thrall Ave. and Beaufort St., Woodhaven, and for the laying of a 10-in. force main in Thrall Ave. from this station to the sewer in Hatch Ave. Work will start in about a month.

Winston-Salem, N. C.—Chairman L. F. Owen, of the sewer committee, reported to the board of aldermen that bids have been received on the proposed sewer lines to be constructed under the issue of bonds recently voted by the people of the city. The territory to be sewered has been divided into three sections, and bids were asked for the construction of each section, separately. District No. 1—Dabbs & Meyers, of Meridian, Miss., bid \$67,300. District No. 2—L. B. Brickenstein and the Crawford Plumbing & Mill Supply Co., bid \$37,800. District No. 3—Stancil & Bros., of Charlotte, bid \$43,000. The board accepted the report of the committee and the Mayor and Secy. were instructed to proceed with the letting of the contracts conditioned upon the sale of the bonds.

Cleveland, O.—Elyria Constr. Co., Elyria, O., for paving, sewer, etc., in Porter Rd., by Comr. of Cuyahoga Co. W. A. Stinchcomb, Engr.

Cleveland, O.—Brookside Construction Co., 3905 West 20th St., by city, sewers in Sandusky Ave., at \$30,880; Farrington Ave., *Gawne Construction Co., 105th St. and Euclid Ave., at \$28,103.

McKeesport, Pa.—Bawman Bros. Co., 639 Jerome St., McKeesport, at \$73,736 sanitary sewerage system.

Waxahatchie, Tex.—Griffin, O'Neal & Sons, 2516 McKenzie Ave., Dallas, by city sewerage disposal plant.

Murray, Utah.—Park Bros., Salt Lake City, at \$27,000, by city, for second part of sewer system.

Richmond, Va.—The administrative board awarded *Wingo & Deaner for a sewer in the alley near Fifth Ave. and Logan St.; cost \$1,534.72.

Pullman, Wash.—W. A. Moss, local, recently secured the contract for construction of the new sewer outflow for which \$4,000 in bonds will be issued as a result of a recent election. Bid was \$3,412.20.

Vancouver, B. C.—Hodgson & King, at \$29,504.07, by civic board of works, for the construction of a 72-in. reinforced concrete intercepting sewer on Beach Ave. Other bids received were: Ledingham & Cooper, \$30,104; M. P. Cotton & Co., \$30,177.90. City Engineer, F. L. Fellowes, \$30,111.70.

Halifax, N. S.—Cook Construction Co., Ltd., 335 Queenspool St., at \$70,000, by city sewers.

Peterboro, Ont.—To supply the city with sewer pipe required for 1917. *H. B. Taylor & Son, Avimer St., secured contract. City Engineer, R. H. Parsons.

Birmingham, Ala.—City commission ordered fire hydrant installed at 10th Ave. and 20th St., Enslev.

Edmonton, Alta.—Council will soon call tenders for four steel tanks to be added to filtration plant. Acting City Engr., A. Haddow.

Colorado Springs, Colo.—Voters decided in favor of issuing \$150,000 water

works improvement bonds. Chas. Keason, Mayor.

Fort Myers, Fla.—Water system to cost \$5,000 will be constructed by the Golf and Yacht Club.

Albion, Ill.—Will vote for water works system a \$19,500 bond issue.

Evansville, Ind.—The water works trustees are contemplating laying a main out St. Joseph Ave. to St. Joseph's Catholic Cemetery, to afford water service to that burial place, Oak Summit Park, other property along the avenue and also adjacent land.

Anamosa, Ia.—City will probably lay additional mains.

Cola, Ia.—City considering the installation of a water works system.

Hamilton, Me.—Town is to have a water works system.

Brunswick, Md.—City voted water works bonds issue of \$75,000.

Worcester, Mass.—George M. Batchelder, of the water department, is to purchase motor supplies.

Mendon, Mich.—City plans to install water works.

Duluth, Minn.—City commission ordered extensions of the following gas and water mains: In 7th Ave., E., from the boulevard to Martha St.; in Superior St., from 41st. to 42d Ave., W.; in Glenwood St., from 54th Ave. east to a point 30 ft. west; in Jay St., from Superior St. to 49th Ave., E.; in Fremont St., from 66th to 67th Ave., W., from Fremont to Natchez St.

Duluth, Minn.—Manager Reed of the water and light department will ask authority from the city council to install a 20,000,000-gallon unit at the Lakewood pumping station. This will be the first improvement planned for 1917, and it is expected active work on the installation of the pump will be started by June 1. Bids will be advertised for and the contract to furnish and install the pump and motor will be awarded. The present capacity of the Lakewood pumping station is 23,000,000 gallons, including two 5,000,000-gallon pumps and one 13,000,000-gallon pump. The new pumping unit will cost approximately \$40,000. During 1917 Manager Reed plans to erect a new pumping station for the Upper Woodland district, known as the orphanage system, and to lay gas and water main extensions from West Duluth to Smithville, Morgan Park, Gary and New Duluth.

New Trier, Minn.—Village proposes to construct elevated tank.

Auburn, N. Y.—Common council approved the legislative act authorizing water board to issue bonds in an amount not to exceed \$200,000 for the purpose of constructing a filtration plant and immediately returned it to Albany for the final formalities, including the governor's signature, before it becomes a law.

Lockport, N. Y.—Common council approved Lockport bills, giving the city authority to sell water from its mains to the county for use at the county tuberculosis hospitals to be erected west of Lockport.

New York, N. Y.—Commissioner Williams has made a request that water meters be installed in all homes.

La Moure, N. D.—The proposition to issue \$10,000 water supply bonds carried.

Chardon, O.—For the purpose of installing a water works system, an election will be held to vote a \$58,000 bond issue.

Defiance, O.—City considering installation of pure water supply system, C. Kuhn, supt.

Hubbard, O.—A \$12,000 bond issue for water works is being planned.

Sharon, O.—City election May 15 to vote on \$58,000 bonds for water works.

Bixby, Okla.—Water works system to cost about \$25,000 to be constructed by the city.

Buffalo, Okla.—A \$15,000 bond issue to construct water works has been authorized.

Ringling, Okla.—Plans are being considered for filtered water.

Wapanucka, Okla.—City plans improvement to water works and light plant.

John Day, Ore.—Town voted bonds to the extent of \$10,000 to be used in constructing a modern gravity water system that will provide ample fire protection as well as supply the domestic demands.

Germantown, Pa.—Bills introduced to lay water pipe in Elkins Ave., from Wister St. to Olney Ave., and in Washington lane, from Limekiln pike to Chelton Ave., and also to pave Elkins Ave. from Wister St. to Olney Ave.

WATER SUPPLY.

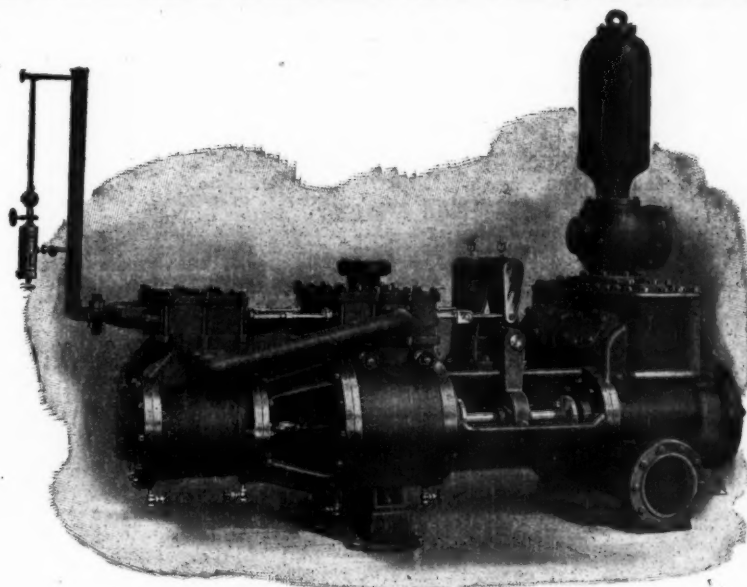


GARDNER

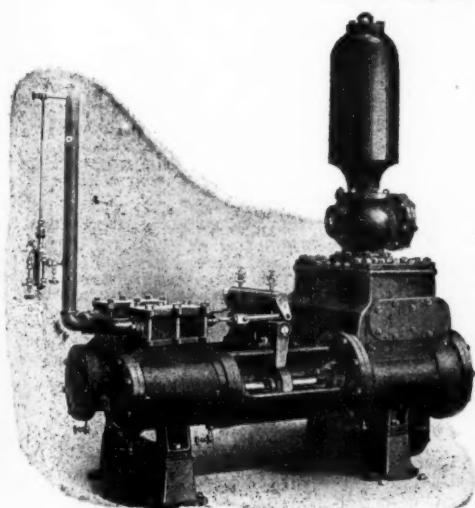


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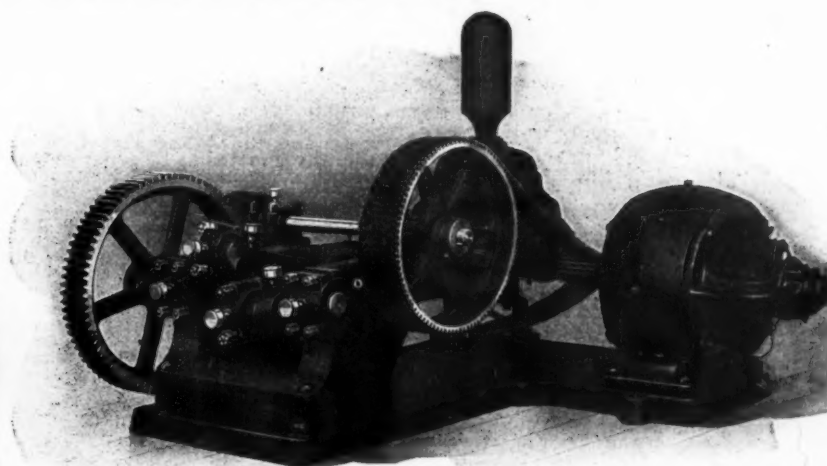
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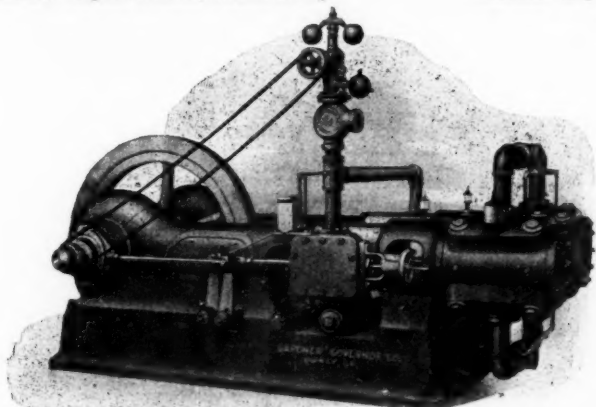
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Gardner Duplex Packed Piston Pump

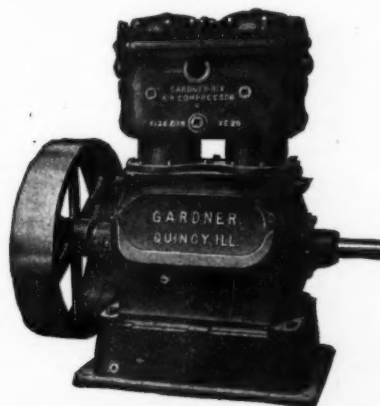


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Germantown, Pa.—See "Streets and Roads."

Wilkes-Barre, Pa.—The Spring Brook Water Co. to act on the suggestions of the national board of insurance underwriters and increase the size of water mains in the central section of the city. The report recommended that the size of the water mains be increased above the 4 and 6-in. size. To carry out the suggestions would mean that about four miles of pipe would have to be relaid. The company has taken the matter up and expressed a desire to go on with the work.

Norfolk, Va.—The board and the lower branch both adopted supplementary resolution, on advice of City Engineer Taylor, providing for the appropriation of \$1,000 for the removal of the idle water pipe between Lake Bradford and Little Creek, for use in laying the proposed mains to the docks.

Norfolk, Va.—Common council passed resolution appropriating \$50,000 for the extension of the city's water mains to the site of the proposed municipal docks, to the land acquired by the American Chain Co. and to other points. The "other points" include the Jamestown exposition site in case it is acquired as a naval base and training station. The money will be secured by the sale of bonds in issues of \$1,000 each.

Mansfield, Wash.—Frank Lebeck, clerk, reports council has passed a resolution providing for the improvement of Douglas St., between 1st and 3d Ave., by laying a 2-in. water main; also same improvement in Walnut St., between Railroad Ave. and 3d Ave.

Cuba, Wis.—J. R. Kay contemplates drilling new city well this summer and water is to be pumped by electricity.

Potosi, Wis.—Voted in favor of issuing \$10,000 water works bonds.

Brantford, Ont.—Water commission to purchase a mechanical device to purify the water supply.

Chatham, Ont.—The Ontario Ry. and municipal board has approved of the by-law authorizing a \$16,600 bond issue for water works extensions. J. W. Adams, city engineer.

Leamington, Ont.—See "Streets and Roads."

Peterboro, Ont.—The utilities commission decided to lay a water main on Parnell St.

Ridgetown, Ont.—The public utilities board has agreed to supply water to several farms in this vicinity.

Simcoe, Ont.—The Town Council will purchase at once a water wagon with combined sprinkler and flushing attachment. Clerk, W. C. McCall.

Hull, P. Q.—The Provincial Board of Health have ordered the city to install a 6,000,000-gal. mechanical filtration plant without delay.

Montreal South, P. Q.—The water works and sewer scheme as now planned amounts to \$180,000. It includes an overhead steel tank of 100,000 gals. capacity 100 ft. from ground level, centrifugal pumps of 800 gals. per minute capacity, 350,000-gal. filter plant, sterilizing outfit, 125-h. p. gasoline motor and 17 streets of vitrified tile sewer to connect with the proposed trunk sewer through Greenfield Park, St. Lambert and Longueuil, to empty into the St. Lawrence River, as approved by the Provincial board of health.

St. Anne de Bellevue, Que.—According to a decision of Quebec superior board of health, which has declared that the water of Lake St. Louis is unfit for drinking purposes, the towns of St. Anne de Bellevue, Pointe Claire and Dorval will have to install filtration plants by next October. The question of the city of Lachine, which also uses the same water, will come up later.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Duluth, Minn.—See "Streets and Roads."

Rochester, Minn.—Centrifugal pump for municipal power plant. Cons. Engrs. Chas. L. Pillsbury Co., 805 Metropolitan Life Bldg., Minneapolis, close April 16. City Clerk, A. F. Wright.

Canton, O.—Service Director Starrett received eight bids on an auxiliary pumping system for the water wells in the west end of the city. Bids are for various styles of pumps and range from about \$10,000 to \$115,000. Include the drilling of wells to replace the present wells. City will decide whether to install an air lift system or some other style of pumping system. Council is

considering employing an expert before buying the pumps.

Mansfield, O.—Service Director Hursh and city officials opened bids for new pumps to be installed in the main pumping station of the water works, which is soon to be electrically equipped throughout. Six bids in all, but two of them complete, were received from manufacturers of power pumps. Received are: Lueitweiler Pump Co., Rochester, \$20,666; Skeldon Engineering Co., Toledo, incomplete, \$20,228; Davro-Doyle Co., Cleveland, incomplete, \$28,680; Gould Manufacturing Co., Seneca Falls, N. Y., \$32,357; Worthington Pump Co., New York, incomplete, \$34,473; Epping-Carpenter Co., Pittsburgh, incomplete, \$39,836. Sixteen bids were also received for the construction of five different sewers in the city. Bids are being tabulated by engineer department. Award will be announced shortly. Bidders were: C. H. Au & Son, Lyman Ostrander and Mike Millitello, city, and Nickols Bros., Canton.

Astoria, Ore.—*M. P. Zindorf, of Seattle, Wash., by the Astoria water commission, for the construction of the 20,000,000-gal. capacity reservoir, at \$120,534.05; *Edw. Sandberg, Portland, Ore., for distribution system, at \$55,996.90. Lars Bergsvik, engineer for commission. The contract for the reservoir includes the following quantities: 161,000 cu. yds. excavation, 1,455 lin. ft. fence, 3,270 cu. yds. concrete, 16,050 sq. yds. asphalt lining, 5 tons special castings, one 2½-in. seaneal connection, 324 ft. 24-in. cast iron pipe, 288 ft. 20-in. cast iron pipe, 708 ft. 14-in. cast iron pipe, 84 ft. 4-in. cast iron pipe, 2 2½-in. hose gate valves, 1,080 ft. 4-in. tiling, 160 ft. 6-in. sewer pipe, 90 ft. 12-in. sewer pipe, 1,000 lin. ft. macadam road, ½ acre road right of way clearing, 270 ft. 8-in. sewer pipe.

Ambridge, Pa.—*R. V. Baldwin, Corapolis, Pa., water works extension, \$45,000, concrete reservoir, 100,000 gallons capacity, piping and small building, power to be obtained from present plant. C. Earl Steel, City Clerk.

Oshkosh, Wis.—Commission council, on recommendation of the board of public works, awarded contract as follows for excavating for water pipes: Central Ave., 620 ft., *Robert Doyle; Lake St., 1,000 ft., *August H. Strey; Knapp St., 410 ft., and Cedar St., 1,070 ft., *Mierswa Construction Co. The prices ranged from 32 to 37 cts. a lin. ft.

London, Ont.—For cast iron pipe for the water mains to be constructed by the utilities commission, city council, to the *Gartshore-Thomson Pipe & Foundry Co., Stuart St., Hamilton.

Longford Mills, Ont.—For a 1,500-gallons per minute duplex pump to operate against 100 lbs. pressure, the Standard Chemical Co. have awarded contract to the *Bawden Pump Co., Ltd., Toronto.

Sandwich, Ont.—Town council for the construction of a water main costing \$20,457, to *Merlo, Merlo & Ray, Walkerville, Engrs., McCall & Fletcher, Gas Bldg., Windsor.

MISCELLANEOUS.

Edmonton, Alta.—Supt. Moir, of the Street Railway, has recommended the installation of a motor generator set. Estimated cost, \$6,100.

San Diego, Cal.—W. H. Faust, of Pasadena, who has submitted his plans to manager of operation, Fred M. Lockwood, will present to council a proposition to build a garbage reduction plant that will be odorless. Plan is to pay \$1 a ton for all garbage delivered to his plant. Will ask for a site on private property for a term of 10 or 15 years' lease or a 50-year contract with the city for use of city land, the city to take over the plant at the end of 50 years.

Pensacola, Fla.—Board of city commissioners voted an appropriation of \$300 to Bayview park for improvements and repairs.

Marshall, Ind.—Bids received May 12, 1917, by Trustee Washington township, Parke county, for sale \$25,000 township bonds, 4½ per cent., 15 years. G. E. Guilleams, Trustee.

Council Bluffs, Ia.—City Council voted to adopt the plan of garbage disposal proposed by the Chamber of Commerce; a proposition to erect a hog-feeding and incinerator plant in conformity with the suggestion of the local chapter of the National Security League, which suggests that all kitchen garbage be fed to hogs under municipal supervision and non-edible garbage burned in a city incinerator. Council directed City Solicitor to draft an or-

dinance making necessary provisions to be reported to the committee of the whole for consideration.

Waltham, Mass.—Orders for a light of 100 c. p. on Jackson St. and for \$500 for an auto for the street department were referred to the public works committee.

Battle Creek, Mich.—The mayor was added to the committee consisting of Commissioners MacGregor and Keren, appointed to investigate the purchase of a motor driven street sweeper.

Duluth, Minn.—Commissioner Silberstein was authorized to advertise for bids on furnishing the city with 25,000 gals. of gasoline, 65 per cent test, during 1917.

Duluth, Minn.—With gasoline threatening to go up, members of the city commission will authorize Commissioner Silberstein, safety head, to advertise for bids on furnishing the city with approximately 25,000 gals. A resolution authorizing him to make a contract for a total of 25,000 or 30,000 gals. of gasoline to be used by all the city departments will be introduced by the commissioner. He estimates that the city will save several hundred dollars on such a deal. According to the plan of Commissioner Silberstein, who obtained estimates from the division heads, the gasoline will be divided as follows: 8,000 gals., fire department; 7,500, police; 1,500, health; 3,000, public works, and 7,000, water and light.

St. Louis, Mo.—Earthwork construction, No. 4396.—Sealed proposals will be received at the office of the secretary, Mississippi River Commission, 1311 International Life Bldg., St. Louis, Mo., for constructing about 100,000 cu. yds. of earthwork in the Hunt Drainage District, Ill. Further information may be had on application to the above-named office.

Garfield N. J.—City council passed resolution appropriating \$1,500 for the purchase of a police patrol.

Albany, N. Y.—City Comptroller John M. Foll sold \$400,000 in four per cent. public improvement bonds, as follows: Albany Savings Bank, \$82,500; the Union Trust Co., \$25,000; the Home Savings Bank, \$50,000; the National Commercial Bank, \$60,000; Eugene Sanford, \$25,500; sinking fund of city, \$10,000; trust funds held by city, \$30,000.

Dunkirk, N. Y.—City authorities will carry out plans suggested by City Engineer W. H. Sheldon for repairing the Central Ave. dock; the north walls are to be straightened out and filled in with concrete. Top will be resurfaced and paved and the railroad switches laid. Bids for work will be opened in May.

New Rochelle, N. Y.—City council appropriated \$17,000 for dredging Echo Bay and making other necessary improvements in the inner harbor to afford an entrance to the new city docks.

Rome, N. Y.—The city engineer is to prepare plans for the club house or shelter to be erected on the playground in S. James St.

Syracuse, N. Y.—Comnr. of Police was directed to erect suitable metal signs in the South St. zone.

Syracuse, N. Y.—A representative of Warren Brothers of New York will make an inspection of the municipal asphalt repair plant for the purpose of determining what repairs are needed to put it in workable condition.

Springfield, O.—City Commission appropriated the sum of \$9,700 and authorized the city manager to call for bids for the erection of a public comfort station on the esplanade along lines originally planned by the city architect.

Springfield, O.—City Comm. rejected the municipal improvement bonds of

Toledo, O.—City council presented with a resolution requesting the service director to report the cost of constructing comfort stations at Madison Ave. and St. Clair St. and also at Superior and Monroe Sts. Was referred to the committee on public improvements.

Portland, Ore.—Council rejected the proposition of Commissioner Dieck, of the department of public works, to submit to the voters a charter amendment providing that the city shall pay 35 per cent of the cost of the elimination of grade crossings.

Johnstown, Pa.—City council is considering the purchase of a combination motor pickup sweeper and sprinkler.

York, Pa.—The Pennsylvania Railroad Co. will be granted permission to construct and maintain underground conduits, ducts, mains, pipes, cables, wires, manholes and other appliances necessary for the operation of telegraph, telephone and signal systems along the tracks in

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DES MOINES
CLEVELAND**

this city, if an ordinance presented to council by Dr. J. H. Bennett is passed finally.

Charleston, S. C.—City council voted to give the ways and means committee the power to act in the question of the proposed purchase of the old baseball park on Meeting St. for the sum of \$26,000 and to investigate the cost of building a modern stable for the city's horses and mules on the lot. The place contains about six acres, and will be used, if purchased, for the storing of the city's materials and possibly selected as a site for the incinerator.

Memphis, Tenn.—City Clerk C. C. Pashby will receive sealed bids until May 22 for 4½, 4¼ or 5 per cent. J. & J., funding and improvement bonds to the amount of \$357,000.

Dallas, Tex.—Dallas County Levee Improvement District No. 2 will vote May 26th on proposed issuance of \$108,000 in bonds for levee work. Will connect

the levee of Dallas County Levee District No. 1 and that of Ellis County Levee District No. 3 on the west side of the Trinity River.

Fort William, Ont.—City Council approved of the construction of the Canadian Pacific spur to reach the industrial sites on the old Canadian Northern coal dock property.

Leamington, Ont.—The town council wants prices on a street flusher. Clerk, R. M. Selkirk.

Tillsonburg, Ont.—Town council plans to purchase oil for various streets. Clerk, A. E. Raynes.

Whitby, Ont.—The Board of Trade will urge the hydro-electric commission to build and operate the portion of the proposed electric railway within the town limits, so as to facilitate the transportation of soldiers between the town and the convalescent home.

Windsor, Ont.—Aldermen authorized the park board to spend \$70,000 to acquire land for park purposes.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Springfield, O.—The *Elgin Street Sweeper Co., of Elgin, Ill., was awarded the contract for another street sweeper.

Klamath Falls, Ore.—The bid of Robert E. Strahorn for the construction of the Klamath Falls Municipal Ry., which will extend from this city to Dairy, Ore., 20 miles east of here, to form a connecting link in the Oregon, California & Eastern R. R., being projected by Mr. Strahorn for Central Oregon, was laid over one week by the city council. The bid was for \$300,000 for the work, construction to begin in 30 days, and to be completed within 10 months.

Chehalis, Wash.—A contract was entered into with the Twin City Auto Co. for the purchase of a street flusher.

TOO LATE FOR CLASSIFICATION

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
STREETS AND ROADS.				
Idaho,	Pocatello	8 p.m., May 6	7,000 sq. yds. cement walk	A. R. Dawson, City Recorder.
O.,	Akron	11 a.m., May 7	Grading and improving roads	County Surveyor.
Mass.,	Boston	noon, May 8	28,000 feet state highway	Mass. Highway Commission.
Ind.,	South Bend	10 a.m., May 8	Paving, curbing and constructing walks	Board of Public Works.
Ill.,	Springfield	11 a.m., May 9	3,300 ft. 15-ft. concrete road, cost \$6,863	State Highway Commission.
R. I.,	Providence	noon, May 9	12.9 miles bit. macadam and cement concrete	State Board of Public Roads.
O.,	Mansfield	2 p.m., May 11	1½ miles tar macadam	County Surveyor.
Ind.,	Richmond	11 a.m., May 12	20,000 gals. Tarvia and 35,000 gals. road oil	L. S. Bowman, Co. Audr.
Pa.,	Wilkes-Barre	May 15	Repairing county roads	County Comrs.
R. I.,	Providence	2.30 p.m., May 16	3.4 miles road relocation	Chief Engr., Board of Water Supply, 661 Westminster St.
SEWERAGE.				
Mass.,	Boston	noon, May 4	Pipe sewers and drains	E. F. Murphy, Comr. of P. W.
Wis.,	Milwaukee	11 a.m., May 7	870 feet 12 and 15-inch sewer	F. O. Phelps, Co. Clerk.
Pa.,	Harrisburg	noon, May 7	Sewer construction	W. H. Lynch, Supt. of Streets.
Ind.,	South Bend	10 a.m., May 8	Sewers in two streets	Board of Public Works.
Ind.,	South Bend	10 a.m., May 15	23,000 feet 6 to 60-inch sewer	Board of Public Works.
Mich.,	Flint	9 a.m., May 18	Tile drainage ditch	A. H. Reid, Co. Drain Comr.
WATER SUPPLY.				
N. Y.,	Olean	1 p.m., May 17	Installing lead service connections	Water Comrs.
Cal.,	Los Angeles	4 p.m., May 18	Furnishing water meters, connections and Washers	Bd. of Pub. Service Comrs.

STREETS AND ROADS.

Sacramento, Cal.—County Engineer R. M. Morton is preparing plans and specifications for the H St. road and the Marysville highway, which will be next roads under the \$1,750,000 bond issue for which bids will be asked.

San Diego, Cal.—City Engineer George Cromwell completed plans for paving two boulevards to connect with the Forrey pines highway. Small assessment districts will be created and many grade crossings eliminated. As soon as the specifications are adopted and the council decides on a plan to raise money to pay the city's share of the cost, bids can be called for.

Redding, Cal.—City trustees ordered asphaltting of eight additional blocks of streets in business district.

Danbury, Conn.—Public works committee making plans for improvements during coming season. Bids for street improvements and new sewers, for which the specifications will be advertised in the near future, must be in the hands of the committee not later than May 10. The laying of a semi-permanent street surface on White St., from Locust Ave. to the city line at a cost of about \$15,000 will be the most important piece of street resurfacing to be accomplished. Post Office and Ives St. extension, as well as White St., will be resurfaced by contract while Hoyt St. will be macadamized.

Hartford, Conn.—Favorable reports were received on appropriation bills in the house, authorizing \$1,000,000 for construction of public roads and state aid roads for two years ending Sept. 30, 1919, \$1,500,000 to complete trunk line highways system for two years ending Sept. 30, 1919, and \$100,000 for purchase of a site for the proposed new state prison.

Perry, Fla.—Voters will decide May 15th on the issuing of \$75,000 street paving bonds.

South Bend, Ind.—Board of works rejected the one bid received for the paving of Hoose court and the alley west of Lafayette St.; will readvertise.

South Bend, Ind.—Board of works ordered asphaltic concrete be used on Harrison Ave. and Leer St. and sheet asphalt on Broadway.

Davenport, Ia.—According to plans of Sidewalk Inspector William Munchrath, permanent sidewalks will, during the summer, be laid from their present terminus on the west side of Brady St. to the Duck Creek bridge.

Ida Grove, Ill.—City council has ordered 35 blocks of asphalt paving for the coming summer, bids on which have been asked. During the year 1916, 50 blocks of asphalt paving were laid.

Sioux City, Ia.—Council deferred until June 9 definite decision on the reconstruction of the West Seventh St. paving.

Ganges, Mich.—Ganges township voted in favor of issuing \$50,000 road bonds.

Albert Lea, Minn.—C. M. Babcock, state highway commissioner, announced that Hennepin, Ramsey and St. Louis counties will receive \$30,000 each and other counties from \$14,325 to \$40,000 each from the state road and bridge fund for 1917 under the apportionment. Various allotments and the counties receiving each amount follow: \$40,000, Chisago and Pine counties; \$20,000, Beltrami, Blue Earth, Dakota, Itasca, Otter Tail and Stearns counties; \$19,500, Sherburne county; \$19,000, Cass Polk and Winona counties; \$18,500, Goodhue county; \$18,000, Aitkin county; \$17,000, Carlton, Olmsted and Renville counties; \$16,500, Mower, Redwood and Washington counties; \$16,325, LeSueur county; \$16,000, Becker, Brown, Faribault, Fillmore, Jackson, Martin, Morrison and Rice counties; \$15,500, Anoka, Cook, Freeborn, Lyon and Nobles counties; \$15,075, Benton county; \$15,000, Carver, Crow Wing, Marshall, Murray and Steele counties; \$14,

750, Yellow Medicine county; \$14,500, Lake and McLeod counties; \$14,325, each of 40 remaining counties not listed above.

Newark, N. J.—Essex Co. Board of Freeholders authorized the issuance of \$600,000 road improvement bonds.

Brightwaters, L. I., N. Y.—Village has called a special election for May 5 on propositions to raise \$34,500 by the sale of the 20-year bonds, the money to be used on the reconstruction of the canal and its improvements with suitable breakwaters and jetties; \$21,000 to be raised in a like manner for the construction of permanent roads; to appropriate \$4,500 for repairing and oiling roads.

Little Falls, N. Y.—Messrs. H. A. Kohler & Co., of New York, successful bidders for street improvement and assessment bonds aggregating \$22,496.45. Starling L. Walrath, City Treasurer.

Erie, Pa.—Engineer Lynch was directed to prepare the data for paving Wayne and Perry Sts. from 21st to 26th Sts.

Beaufort, S. C.—Messrs. R. M. Marshall & Bros., of Charleston, were the successful bidder for \$15,000 Bay St. improvement bonds. H. G. Otis, City Manager.

Austin, Tex.—Attorney General approved an issue of \$9,500 of street refunding bonds of the town of Rockport.

Goldthwaite, Tex.—Mills county voted in favor of issuing \$15,000 road bonds.

Cheyenne, Wyo.—Council instructed city clerk to advertise for bids for the following improvements: \$20 lin. ft. cement sidewalk on east side Seymour St. from 23d St. north; cement curb on three sides of the City, Gilchrist and Pioneer parks; cement safety zone at intersection of Carey Ave., 26th St. and Randall Blvd.; also for all cement crosswalks, approaches, crossings, culverts, etc., to be installed during 1917. J. J. Showalter, City Clerk.

Galesville, Wis.—Citizens voted in favor of issuing \$9,000 road improvement bonds.